CAMBRIDGE CRITICAL GUIDES

Die Philosophie der Natur
§. 192.
Die Natur hat sich als die Idee in der Fo
ers seyns ergeben. Da in ihr die Idee
ative ihrer selbst oder sich äusserlich ist, so
ur nicht nur relativ äusserlich gegen diese Idee
die Aeusserlichkeit macht die Bestimmun
elcher sie als Natur ist.
§. 193.
In dieser Aeusserlichkeit haben die Begriffs
gen den Schein eines gleichgültigen Best
der Vereinzelung gegeneinander; der
egen als Innerliches. Die Natur zeigt d
Daseyn eine Freyheit, sondern Nothwe
und Zufälligkeit.
Die Natur ist deßwegen nach ihrer best
Existenz, wodurch sie eben Natur ist, nicht
dern; noch sind Sonne, Mond, Thiere,
gsweise vor menschlichen Tha
Begebenheiten, als Werke Gottes zu betrach
anzuführen. — Die Natur ist an sich, in d
göttlich, aber in dieser ist ihre bestimmte
Weise, wodurch sie Natur ist, aufgehoben.
ist, entspricht ihr Seyn ihrem Begriffe nic
existirende Wirklichkeit hat daher keine Wah
ihr abstractes Wesen ist das Negative wie di
das non-ens ge
ben. Weil sie aber obzwar in solchem Elemen
stellung der Idee ist, so mag man in ihr
Weisheit Gottes bewundern; wenn aber
sagte, daß ein Strohhalm hinreiche, um da

# HEGEL'S
## *Philosophy of Nature*
## *A Critical Guide*

*Edited by*
Marina F. Bykova

# HEGEL'S PHILOSOPHY OF NATURE

Hegel's Philosophy of Nature constitutes the second part of his mature philosophical system presented in the *Encyclopaedia of the Philosophical Sciences*, and covers an exceptionally broad spectrum of themes and issues, as Hegel considers the content and structure of how humanity approaches nature and how nature is understood by humanity. The essays in this volume bring together various perspectives on Hegel's Philosophy of Nature, emphasizing its functional role within the *Encyclopaedia* and its importance for understanding the complexity of Hegel's philosophical project. Together they illuminate the core ideas which form Hegel's philosophical framework in the realm of nature.

MARINA F. BYKOVA is Professor of Philosophy at North Carolina State University. She has most recently edited *Hegel's Philosophy of Spirit: A Critical Guide* (2019), *The German Idealism Reader: Ideas, Responses and Legacies* (2019), *The Bloomsbury Handbook of Fichte* (2020), and *The Palgrave Hegel Handbook* (coedited with K. Westphal, 2020).

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Aristotle's *Nicomachean Ethics*
EDITED BY JON MILLER

*Continued after the Index*

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## *A Critical Guide*

EDITED BY

MARINA F. BYKOVA

*North Carolina State University*

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*To John W. Burbidge, colleague and friend*
*In Memoriam*

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# *Abbreviations*

The following is a list of abbreviations used throughout the volume for core references, along with their English translations. References to pages in English translations are provided only when the translation lacks pagination from the critical edition of the relevant thinker's works. If translations have been modified, this is explicitly stated either in a text or in a note, and unless otherwise noted, all emphases are in the original.

Multivolume editions are cited by volume: page numbers; when necessary, line numbers are also included (volume: page.line numbers). Works divided into numbered sections are cited by section (§) number.

## Hegel's Writings

Hegel's works *Encyclopaedia of the Philosophical Sciences* and *Philosophy of Right* are cited using section (§) numbers. For these works, "R" indicates Remarks (*Anmerkungen*) and "A" indicates Additions (*Zusätze*). When citing Hegel's published Remarks, the section number is followed by the suffix "R," as in "§345R." When citing student notes from Hegel's lectures, the section number is followed by the suffix "A," as in "§345A." When both a main section and a remark or a lecture note are cited, an ampersand is inserted, as follows: "§345 & R" or "§345 & A."

| | |
|---|---|
| *Diff.* | "Differenz des Fichte'schen und Schelling'schen Systems der Philosophie." *Kritisches Journal der Philosophie* 1(1) (1801): 111–84; rpt. *GW* 4:3–92. (English translation: *The Difference Between Fichte's and Schelling's System of Philosophy*, ed. and trans. H. S. Harris and W. Cerf [Albany, State University of New York Press, 1977].) |
| *Diss.* | "*Philosophical Dissertation on the Orbits of the Planets* and the *Habilitation Theses*," trans. Pierre Adler. In *Miscellaneous Writings of G. W. F. Hegel*, ed. Jon |

| | |
|---|---|
| | Stewart. (Evanston: Northwestern University Press, 2000.) |
| *Enc.* | *Enzyklopädie der philosophischen Wissenschaften* (1st ed.: 1817, 2nd ed.: 1827, 3d ed.: 1830), 3 vols., *GW* 13, 19, 20; cited by §, as needed with the suffix "R" or "*Z*" (for explanation see start of section). |
| *Enc.* 1 | *Hegel's Encyclopedia Logic*, trans. T. Geraets, W. Suchting, and H. S. Harris. (Cambridge, MA: Hackett, 1991.) |
| *Enc.* 1BD | *Encyclopedia of the Philosophical Sciences in Basic Outline – Part 1: Science of Logic*, trans. and ed. K. Brinkmann and D. O. Dahlstrom. (Cambridge: Cambridge University Press, 2015.) |
| *Enc.* 2 | *Hegel's Philosophy of Nature*, trans. A. V. Miller. (Oxford: The Clarendon Press, 1970; 2nd ed. 2014.) |
| *Enc.* 2P | *Hegel's Philosophy of Nature*, 3 vols., ed. and trans. M. J. Petry. (London: George Allen & Unwin; New York: Humanities Press, 1970.) |
| *Enc.* 3 | *Hegel's Philosophy of Mind,* trans. W. Wallace and A. V. Miller. (Oxford: Clarendon Press, 1976.) |
| *Enc.* 3I | *Hegel's Philosophy of Mind*, trans. W. Wallace and A. V. Miller, with revisions and commentary by M. J. Inwood. (Oxford: Clarendon Press, 2007.) |
| *Enc.* 3P | *Hegel's Philosophy of Subjective Spirit* (*Enc.* 3, §§377–482), 3 vols., trans. and ed. M. J. Petry. (Dordrecht: D. Reidel, 1978.) |
| *ENZ* | *Enzyklopädie der philosophischen Wissenschaften (1830).* (Hamburg: Felix Meiner, 1991.) |
| *GVNat* | Vorlesung über Naturphilosophie Berlin 1823/24. Nachschrift von K. G. J. v. Griesheim, hrsg. v. G. Marmasse. (Frankfurt a.M. et al.: Peter Lang, 2000.) |
| *GW* | *Gesammelte Werke*, 21 vols. Deutsche Forschungsgemeinschaft, with the Hegel-Kommission der Rheinisch-Westfälischen Akademie der Wissenschaften and the Hegel-Archiv der Ruhr-Universität Bochum. (Hamburg: Meiner, 1968–2017.) |
| *HEnc.* | *Encyclopädie der philosophischen Wissenschaften im Grundrisse*. (Heidelberg: August Osswald's Universitaetsbuchhandlung, 1817.) |
| *IPH* | *Introduction to the Philosophy of History*, trans. Leo Rauch. (Indianapolis: Hackett, 1988.) |

| | |
|---|---|
| *JS III* | *Jena Systementwürfe III (1805–1806). GW* 8. |
| *LFA* | *Hegel's Aesthetics: Lectures on Fine Art*. 2 vols., trans. and ed. T. M. Knox. (Oxford: Oxford University Press, 1975.) |
| *LHP-B* | *Lectures on the History of Philosophy: The Lectures of 1825–1826*. 3 vols., trans. and ed. R. F. Brown. (Oxford: Oxford University Press, 2009.) |
| *LPhWH-N* | *Lectures on the Philosophy of World History : Introduction, Reason in History*, ed. Johannes Hoffmeister, trans. H. B. Nisbet (Cambridge: Cambridge University Press, 1975.) |
| MM | *Werke in 20 Bänden*, ed. Eva Moldenhauer and Karl Markus Michel, 20 vols. (Frankfurt am Main: Suhrkamp, 1969–71) |
| *PhG* | *System der Wissenschaft. Erster Theil, die Phänomenologie des Geistes* (1807). *GW* 9. |
| *PR* | *Elements of the Philosophy of Right*, ed. A. Wood, trans. H. B. Nisbet. (Cambridge: Cambridge University Press, 1991.) (Translation of *Naturrecht und Staatswissenschaft im Grundrisse: Grundlinien der Philosophie des Rechts* (1821). *GW* 14. |
| $PR_H$ | *Hegel's Philosophy of Right*, 2nd ed., ed. T. M. Knox, trans. S. Houlgate. (Oxford: The Clarendon Press, 2008.) |
| *PS* | *The Phenomenology of Spirit*, trans. T. Pinkard. (New York: Cambridge University Press, 2018.) Cited by paragraph numbers. |
| *SL* | *The Science of Logic*, trans. George di Giovanni. (Cambridge: Cambridge University Press, 2010.) |
| *UVNat* | Vorlesung über Naturphilosophie Berlin 1821/22. Nachschrift von Boris von Uexküll. Hgg. v. Gilles Marmasse und Thomas Posch. (Frankfurt a.M. et al: Lang, 2002.) |
| *V* | *Vorlesungen: Ausgewählte Nachschriften und Manuskripte*. 16 vols. (Hamburg: Meiner, 1983–.) |
| *VGPh-L* | *Vorlesungen über die Philosophie der Geschichte*, with an Introduction by Theodor Litt. (Stuttgart: Reclam, 1961.) |
| *VGPh1–4* | *Vorlesungen über die Geschichte der Philosophie*. In *Vorlesungen*, vols. 6–9, ed. P. Garniron and W. Jaeschke. (Hamburg: Meiner, 1986–96.) |
| *VHGesch* | *Die Vernunft in der Geschichte*, ed. J. Hoffmeister. Hamburg: Felix Meiner, 1955. |

| | |
|---|---|
| *VNat1* | *Vorlesungen über die Philosophie der Natur (1819–1820). Vorlesungen* vol. 16, ed. M. Bondeli and H. N. Seelmann. (Hamburg: Meiner, 2002.) |
| *VNat2* | *Vorlesungen über die Philosophie der Natur (1825–1826). Vorlesungen* vol. 17, ed. K. Bal, G. Marmasse, Th. Posch, and K. Vieweg. (Hamburg: Meiner, 2007.) |
| *VNat-GW* | *Vorlesungen über die Philosophie der Natur. GW* 24. |
| *VNat1-GW* | Nachschriften zu den Kollegien der Jahre 1819/20, 1821/22 und 1823/24. Hg. v. Wolfgang Bonsiepen. 2012. *GW* 24,1 |
| *VNat2-GW* | Nachschriften zu den Kollegien der Jahre 1825/26 und 1828. Unter Mitarbeit von Wolfgang Bonsiepen hg. v. Niklas Hebing. 2014. *GW* 24, 2. |
| *VNat3-GW* | Sekundäre Überlieferung. Hg. v. Niklas Hebing. 2016. *GW* 24,3. |
| *WL* | *Wissenschaft der Logik. Erster Band: Die objective Logik (1812). GW* 11.<br>*Wissenschaft der Logik. Zweiter Band: Die subjective Logik oder Lehre vom Begriff (1816). GW* 12.<br>*Wissenschaft der Logik. Erster Teil: Die objective Logik. Erster Band. Die Lehre vom Seyn (1832). GW* 21. |

## Kant's Writings

| | |
|---|---|
| *Ak.* | *Kants Gesammelte Schriften*, 29 vols. Königlich Preußische (now Deutsche) Akademie der Wissenschaften. (Berlin: G. Reimer, now De Gruyter, 1902–) |
| *CJ* | *Critique of the Power of Judgment*, ed. P. Guyer, trans. P. Guyer and E. Matthews. (Cambridge: Cambridge University Press, 2000.) (English translation of *Kritik der Urteilskraft* [1790], *Ak* 5.) Cited by *Ak* paragraph numbers. |
| *CNM* | "Attempt to Introduce the Concept of Negative Magnitudes into Philosophy (1763)." In *Theoretical Philosophy, 1755–1770,* trans. and ed. David Walford in collaboration with Ralf Meerbote. (Cambridge: Cambridge University Press, 1992.) |
| *Corr.* | *Briefwechsel.* In *Ak*. 10 (1747–88)/*Ak*. 11 (1789–94). (English translation: *Correspondence,* trans. and ed. A. Zweig. (Cambridge: Cambridge University Press, 1999.) |
| *CPR* | *Critique of Pure Reason*, trans. and ed. P. Guyer and A. Wood. (Cambridge: Cambridge University Press, 1998.) (English translation of *Kritik der reinen Vernunft*, 1st ed., 1781 [A], *Ak* 4; 2nd ed., 1787 [B], *Ak* 3.) Cited by A/B pagination. |

*MFNS* *Metaphysische Anfangsgründe der Naturwissenschaft* (1786), *Ak* 4. (English translation: *Metaphysical Foundations of Natural Science*, trans., ed. M. Friedman. [Cambridge: Cambridge University Press, 2004].)

*MMr* *Metaphysik Mrongovius*. In *Ak*. 29, 747–940. (English tanslation: *Metaphysic Mrongovius* [1782–83]. In I. Kant, *Lectures on Metaphysics*, trans. and ed. Karl Ameriks and Steve Naragon, 109–286. [Cambridge: Cambridge University Press, 1997].)

*Ref.* *Reflexionen zur Physik und Chemie.* In *Ak*. 14, *Kants*

*PC* *Handschriflicher Nachlaß*, Bd. I. *Mathematik-Physik und Chemie Physische Geographie*, 63–537.

*THA* *Allgemeiner Naturgeschichte und Theorie des Himmels oder Versuch von der Verfassung und dem mechanischen Ursprunge des ganzen Welgebäude, nach Newtonischen Grundsätzen abgehandelt.* In *Ak*. 1: 215–368. (English translation: *Universal Natural History and Theory of the Heavens or Essay on the Constitution and the Mechanical Origin of the Whole Universe according to Newtonian principles* [1755]. In I. Kant, *Natural Science*, ed. Eric Watkins, trans. Lewis White Beck et al., 182–308. [Cambridge: Cambridge University Press, 2012].)

## Schelling's Writings

*HKA* *Werke: Historisch-Kritische Ausgabe*. Projekt Schelling – Edition und Archiv der Bayerischen Akademie der Wissenschaften. (Stuttgart-Bad Cannstatt: Frommann-Holzboog, 1976–.)

*HMPhA* *On the History of Modern Philosophy*, trans. Andrew Bowie. (Cambridge: Cambridge University Press, 1994.)

*PSPh* *Presentation of My System of Philosophy* (1801). In *The Philosophical Rupture between Fichte and Schelling: Selected Texts and Correspondence (1800–1802)*, trans. and ed. Michael G. Vater and David W. Wood, 141–205. (Albany: State University of New York Press, 2012. SSW I/4.)

*SW* *Schellings Werke*, ed. M. Schröter. (Munich: Beck, 1958.)

*Tim* *Timaeus (1794): Zur Bedeutung der Timaeus-Handschrift fur Schellings Naturphilosophie*, ed. Hartmut Buchner and Hermann Krings. (Stuttgart-Bad Cannstatt: Frommann-Holzboog, 1994.)

# *Hegel's Philosophy of Nature*
## *Its Origins, Development, and Contemporary Relevance*

*Marina F. Bykova*

Over the past three decades, there has been a growing surge of interest in Hegel among Anglophone scholars. Initially, this interest was predominantly directed toward the study of his major published works, including the *Science of Logic*, the *Phenomenology of Spirit*, and the *Philosophy of Right*. In recent years, the *Encyclopaedia of the Philosophical Sciences*, which was previously undervalued and viewed primarily as a secondary text for teaching purposes alongside Hegel's lectures, has started to receive the recognition it deserves. However, despite acknowledging the immense significance of the *Encyclopaedia* as the only form in which Hegel ever published his entire mature philosophical system, certain parts, such as the Logic and the Philosophy of Spirit, have garnered a disproportionately greater attention from scholars. The Philosophy of Nature, which holds a central position within Hegel's tripartite comprehensive philosophical system as its second part, has remained marginalized in terms of its systematic importance and contemporary relevance, if not largely overlooked altogether.

### 0.1 On the Reception of Hegel's Philosophy of Nature

To be sure, over almost two centuries since the release of the third edition of the *Encyclopaedia* in which Hegel introduced the final revisions to the text of his Philosophy of Nature, there have been several reputable instances of positive receptions of Hegel's natural philosophy worth mentioning. The first is associated with the "Hegel Renaissance" at the turn of the twentieth century and during its first decades. It is true that despite an intensifying enthusiasm about Hegel and a new rise of Hegelianism, many commentators maintained a generally skeptical and dismissive stance toward his philosophy of nature, which is particularly evident within the German scholarly community.[1] However, at the same time, in England,

[1] For publications reflecting the early (1802–41) reactions to Hegel's philosophy of nature, see Neuser 1987b (cited in Ferrini 2014, 3n8).

such scholars as Charles Sanders Peirce, Alfred North Whitehead, and John M. E. McTaggart were in the process of developing ideas that show substantial influence from Hegel, including his philosophy of nature. Perhaps the most prominent example was Peirce, who openly claimed to have revitalized Hegel's metaphysics and philosophy of nature in his own interpretation of matter as "effete mind" and his speculative notions concerning the spiritual attributes of cytoplasm, elaborated in his work *Man's Glassy Essence* (1892). Significant parallels can be also drawn between Hegel's views of nature and Whitehead's process philosophy that develops similar ideas. One such example is Hegel's conception of organism that undoubtedly inform Whitehead's metaphysics of *Process and Reality* (1929), a work often described by the author and commentators as "the philosophy of organism" (see Tabaczek 2013). One of the key representatives of the second wave of British idealism, John McTaggart, dedicated decades to grappling with Hegel's ideas, culminating not only in numerous interpretations and critical commentaries on Hegel's works but also in his original metaphysical system expounded in the two-volume masterpiece *The Nature of Existence* (1921; 1927). This work advances concepts closely aligned with Hegel's ontology, underscoring McTaggart's profound engagement with Hegelian thought but also providing an opportunity to see how this thought inspired new ideas (Kreines 2008b).

When, after a long period of outright rejection, in the 1980s and 1990s, Hegel's star rose again in the Anglo-Saxon world, so did efforts to revive Hegel's Philosophy of Nature emerge.[2] Initiated by the 1970 publication of Michael Petry's English translation of the 1830 *Encyclopaedia* Philosophy of Nature (*Enc.* 2P), accompanied by an elaborate commentary that illuminated the importance of this part of Hegel's system in comprehending his overall philosophy, those efforts materialized in intensified attempts to engage the topic (Hortstman et al. 1986; Petry 1987; 1993; Burbidge 1996; Houlgate 1998).

Nevertheless, many scholars who recognized the importance of Hegel's philosophy of nature within the comprehensive framework, and lauded its essential role in interpreting the transition from Idea to Spirit, still harbored contempt for the outcomes presented by Hegel in this realm. They cast doubt on the scientific validity of his conception of nature and the relevance of the content of his natural philosophy to then-contemporary results from the empirical sciences (Pippin 1989, 66; 2002; Bungay 1994,

[2] For a more detailed discussion of the reception of Hegel's Philosophy of Nature in this period, see Ferrini 2014.

32–33). It is only during the last decade that scholars began showing a renewed interest in Hegel's philosophy of nature, setting in motion its close examination (Stone 2005; Rand 2010; Khurana and Menke 2011; Stone 2013; Giladi 2014; Corti and Schülein 2023a). What is characteristic of the present engagement with this topic is an increasing renunciation of the dismissive attitude toward Hegel's philosophy of nature and a growing appreciation for its contents worthy of recognition in its own right. This has expanded the topics of inquiry from traditional, merely systematic questions, such as the place and actual functionality of this area within Hegel's mature philosophical system, the relation of Nature to the Idea and Spirit, to more specific ones, including the development of Hegel's concept of embodied life, his notion of organism, and such issues as human nature, human autonomy, and the emergence of consciousness (Corti and Schülein 2023a; 2023b). Prompted by a growing appeal of a "metaphysical" reinterpretation of Hegelian thought (Pippin 2002; 2017; Kreines 2015) and the lately introduced "naturalist" reading of Hegel (Pinkard 2012; Stone 2013; Giladi 2014), contemporary scholarship has been marked by attention to aspects crucial to understanding Hegel's project of the philosophy of nature and the strategy he employs there. This requires an investigation of a variety of topics treated by Hegel in each of the three main sections of his Philosophy of Nature – the "Mechanics," "Physics," and "Organics" – along with their subsections. Aspects of Hegel's thought introduced in the "Organics" are generally better represented in the recent secondary literature than their counterparts from the "Mechanics" and "Physics" (Rand 2017, 395). While such a disparity is not surprising, especially given the present appeal of the concept of life and intensified attempts to understand the emergence of organic nature largely fueled by contemporary research in the biological sciences, insufficient coverage of topics from the "Mechanics" and "Physics" leads to an incomplete picture of Hegel's Philosophy of Nature, which makes the development of an explicit evaluation of its rich and complex content, as well as an appreciation of its systematic function and task, difficult to achieve.

The present collection addresses this gap by offering a systematic reading of the Philosophy of Nature and its key topics, emphasizing the methodically and coherently organized unity of this part of Hegel's tripartite philosophy and its harmonious relation to two others. The idea of the whole and its organic development, so pervasive throughout Hegel's system, could not be grasped properly without revealing the aims he associates with his philosophy of nature. Similarly, it would be a mistake to approach the Philosophy of Nature as merely an "empty otherness"

outdated scientifically and void of any independent philosophical significance. Hegel never intended his Philosophy of Nature to be a rival to the empirical sciences but rather developed it as an independent philosophical discipline capable of grasping nature and natural things through reason, as opposed to the natural sciences whose results belong to the domain of the understanding. Important in its own right, Hegel's *Naturphilosophie* generates a philosophically sophisticated account of nature as a complex process of formation, leading toward organic life.

## 0.2 Theoretical Roots and the Evolution of Hegel's Views of a Philosophy of Nature

### *0.2.1 Influences and Inspirations*

As a representative of the post-Kantian tradition, Hegel develops his views of the philosophy of nature, being inspired by the consistent efforts of his contemporaries to come up with a plausible picture of the natural world and the kinds of relations existing between and within natural objects. While well informed in the advances of the sciences of his day, Hegel and his thought are certainly situated in the context of post-Newtonian scientific developments manifested through the expansion and blossoming of "Romantic science." Comparatively "new" phenomena such as electricity, magnetism, and chemistry that turned out to be inexplicable in terms of Newtonian forces served as an impetus for further scientific explorations, providing material for philosophical reflection. Hegel's own views depicted in his studies of the philosophy of nature are very much representative of a scientific outlook of his day. It suffices to recall that the idea that electricity and magnetism serve as a bridge between mechanism, organic life, and consciousness, which is so prominently featured in Hegel's writings, is essentially a product of "Romantic science" considered by many at that time to be plausible. Perhaps the most significant result of Romanticism in science was an introduction of a new "organic" conception of nature, which stood in sharp contrast to its Newtonian (mechanistic) counterpart that prevailed in England and Continental Europe at the time (Beiser 1992; 2003; Richards 2002; Klancher 2013). This is the idea that determined the development of post-Kantian *Naturphilosophie*, championed by Schelling and later advanced by Hegel. When scholars of German idealism point to an influence that Romantics' scientific views had on the emergence of Hegelian and Schellingian thought, they afford the most important role to Schiller's theory of nature and Goethean science (Hoffheimer

1985; Richards 2002; Beiser 2005, 23–27, 37–46; Nassar 2010; Förster 2012, 168–72, 254–58, 265–76). It was indeed Schiller who first drew the attention of his contemporaries to nature as an object of a true inspiration, insisting, "our culture should lead us along the path of reason and freedom back to nature" (Schiller 1993, 180). Goethe and his conception of natural science ("morphology") served as a strong impulse for the development of a new *Naturphilosophie*, offering a concept of natural order that more closely corresponds to the emerging picture of a nature now seen to be dynamic and ever-changing, to nature's "infinitely free exercise of life" (*Lebenstätigkeit*) (Goethe 1987, 413).

Both Schiller and Goethe, whose works Hegel first encountered while in Frankfurt and continued to follow closely thereafter, had a profound impact on his philosophical development and the maturation of his thought (Hoffheimer 1985, 242–44; Förster 2012, 320, 360, 362, 370f.). In the realm of natural philosophy, one of the most profound influences on Hegel, with enduring effects for decades, was his friend and fellow student at the Tübingen Seminary (*Stift*), Friedrich Schelling. Some commentators have even credited Schelling with the "invention" of post-Kantian *Naturphilosophie*. While this assessment is somewhat problematic, especially since Goethe had already produced several writings on the subject by 1800, introducing significant concepts in natural philosophy, Schelling's role as a central and pivotal figure in the natural philosophy of that era cannot be overstated. Hegel's growing interest in a philosophical exploration of nature at the outset of his academic journey can be largely attributed to his collaboration with Schelling in Jena from 1801 to 1803. Their initial programs in *Naturphilosophie* shared numerous similarities and fundamental overlaps. However, their divergent views on the philosophy of nature and its place within their systems marked a significant contrast between the thinkers. It was Hegel's dissatisfaction with Schelling's portrayal of nature as a "series of stages" that motivated his own search for "understanding the necessity of the various forms of nature," the project he launched in Jena (*Enc.* 2 §249A).

### *0.2.2 Tracing a Pathway to the* Encyclopaedia *Philosophy of Nature*

#### *0.2.2.1 Dissertatio Philosophica de Orbitis Planetarum*

Hegel's first work on topics directly relevant to his interest in natural philosophy is his *Dissertatio philosophica de orbitis planetarum* (1801). Commenting on this early publication, scholars tend to primarily focus,

often exclusively, on a notable mistake made by Hegel within it. It pertains to his erroneous dismissal of astronomers' predictions – founded upon the Titius–Bode arithmetical sequence, commonly known as the Bode law – regarding the existence of an eighth planet situated between Mars and Jupiter. Even J. H. Stirling, who was among the few early proponents of Hegel's philosophy of nature, expressed regret in 1873 that the *Dissertatio* was ever written, acknowledging the presence of serious flaws in the work (Stirling 1977, 100).[3] However, while this "grave miscalculation" of Hegel's stands as a fundamental point of the text, it is far from being the sole or even the most significant outcome of this work. Within the text, Hegel formulates some elements of his *Naturphilosophie* for the first time, and many of the ideas he presents in this work remain largely unchanged in his subsequent writings, including the *Encyclopaedia* Philosophy of Nature.

A key concept among these notions is the organic perspective within natural philosophy, which entails the idea of the universe as a coherent organic entity. This organic viewpoint conceives of the universe as a whole, emphasizing the interconnectedness of the natural realm and stressing a continuity between inorganic and organic nature, life, and (human) mindedness. All these components harmoniously coexist within an organic unity, where their interrelationships are governed by the whole. These organicist views fundamentally shape and inform Hegel's stance toward the empirical sciences. He holds that in physics, it is crucial to proceed from a holistic approach to nature, and advocates the comprehension of the solar system as a complex living entity within the field of astronomy. Hegel's anti-reductionism, clearly visible in his later versions of the *Encyclopaedia* Philosophy of Nature, directly emanates from his organic convictions.

Another salient topic addressed in the *Dissertatio* pertains to Isaac Newton and his foundational physical laws and principles. Hegel's understanding of Newton and his ideas about matter and motion, initially formulated in the *Dissertatio*, persist consistently, in largely unchanged form, throughout his academic trajectory.

Considerable attention within the *Dissertatio* is devoted to scrutinizing the relationship between mathematics and physics. Hegel criticizes Newton's mathematical demonstration of Kepler's second law of planetary motion, rebuking the amalgamation of mathematical considerations with

[3] Cited in Ferrini 2014, 2n6. In the 1817 edition of the *Encyclopaedia*, Hegel acknowledged the inadequacy of his attempt to establish a law governing the distances of planets from the sun. In the subsequent editions of the *Encyclopaedia* (1827 and 1830), he omitted any reference to his dissertation.

physical ones. He cautions against the utilization of mathematical techniques in physics when driven solely by mathematical expediency and procedural efficiency.[4] Interestingly, the *Dissertatio* outlines the core directions of Hegel's subsequent critique of the force concept. Within this context, Hegel emerges as an original thinker, introducing several ideas later adopted by Schelling. Notably, Hegel's interpretation of the interplay between Kepler's and Newton's mechanics, as delineated in the *Dissertatio*, eventually found resonance in Schelling's work (*SW* I/4: 330; 432; see also Closs 1908).

### *0.2.2.2 The Jena System Drafts*

During his time in Jena, Hegel showed a profound interest in the philosophical inquiry into nature, initially allocating to the philosophy of nature a much more prominent role and position compared to its eventual place in his mature system (Beiser 2003, 138–39). The systematic works produced during this phase include three Jena Drafts of a Philosophical System that contain substantial surviving fragments delving into the realm of philosophy of nature. The most thorough exploration of this subject can be found in two key documents from this period: The First Systematic Draft of *Naturphilosophie* from 1802–3 (*Erster Entwurf eines Systems der Naturphilosophie*) and *Jenaer Realphilosophie* from 1805–6 (see *GW* 5; *JS III* / *GW 8*). Both these documents are based on manuscripts of lectures that Hegel delivered during his time in Jena. These writings stand as foundational records of his evolving ideas on the philosophy of nature during this early period of his intellectual development.

The distinguishing feature of all the Jena iterations of Hegel's philosophy of nature lies in his initiation with the concept of "ether." This concept, coupled with the notion of "matter" (*Materie*), forms the foundational framework through which he scrutinizes natural phenomena, as well as their interplay and processes.

Hegel introduces "ether" as something akin to a materialized Absolute, which unfolds itself within space and time. This "absolute matter" (as he calls it) becomes the crux of his exploration, where the philosophy of nature endeavors to interpret diverse natural phenomena in their interactions with each other as distinct manifestations of this absolute matter. Hegel's aim goes beyond merely demonstrating that each natural

[4] For a very informative discussion of a specific content of Hegel's 1801 *Dissertation* see Ferrini 2014, 1–2.

phenomenon represents a particular expression of absolute matter. He seeks to establish that nature embodies a cohesive and structured arrangement, where every natural phenomenon constitutes an integral element within a systematic sequence of natural occurrences. This approach serves two main purposes. It (1) reaffirms an organic (organicist) view of nature while advancing the idea of its underlying systematic organization; and (2) allows for the perception of the natural order as shaped by specific principles emerging from the structural attributes of absolute matter, rather than being externally imposed.

These foundational principles persist consistently throughout all versions of Hegel's philosophy of nature from the Jena period. Variations in these versions primarily stem from the incorporation of newly available scientific information resulting from the advancements of contemporary science. For instance, the 1802–3 manuscripts lack a developed section on organic life, yet Hegel introduces it in his 1805–6 lectures in response to several scientific developments such as the emergence of paleontology and the evolution-based ideas gaining ground within biology.

#### *0.2.2.3 The Phenomenology*

While the *Phenomenology of Spirit* (1807) does not directly deal with issues central to the philosophy of nature, it contains two sections that are somewhat pertinent to its themes and can also shed light on how Hegel positions it within his mature system. One such section is the chapter titled "Force and Understanding, Appearance and the Supersensible World" (III). In this chapter, Hegel explores the relation of natural scientific cognition to its object. Distinguishing between the essence and the phenomenon, consciousness as the understanding reduces the realm of phenomena to the stable existence of matter, conceiving of it as the action of force. Even more significant is the chapter titled "Observing Reason" (V.A), where Hegel outlines some primary ideas of his philosophy of nature. This chapter traces the progression of consciousness from mere perception to the universality of thought. The advancement occurs through the discovery of forces and laws operating within nature, and this process describes our self-conscious cognitive engagement with the world, informed by the findings of empirical sciences.[5] While in the Philosophy of Nature Hegel presents an unfolding development encompassing the transitions from the

[5] For a detailed discussion of this chapter and its significance for Hegel's mature philosophy see Ferrini 2009b.

inorganic to the organic and thinking life, in the *Phenomenology* he is more concerned with the gradual progression of forms of consciousness and the specific structures of consciousness in relation to nature.

It is also noteworthy that in the *Phenomenology*, Hegel distances himself from Schelling's reductionist approach, which seeks to explain the organic unity of both inorganic and organic nature by relying on quantitative forces and laws that drive the organized inner productivity of nature's development. This divergence illustrates Hegel's distinct perspective on the relationship between nature and consciousness and the underlying principles that shape their interactions.

#### *0.2.2.4 The Encyclopaedia*

Hegel develops his own philosophy of nature as a system of qualitatively differentiated stages, the first exposition of which he gives in his 1817 *Encyclopaedia of the Philosophical Sciences* that in its entirety represents his mature philosophical system. Presented as the second part of the system, and positioned between Logic (the ideal part) and the Philosophy of Spirit (the real part), the Philosophy of Nature now acquires its systematic place as the domain of the "self-externality of the concept" (*SL* 536/*GW* 12: 39). Its primary objective is to grasp the (logical) Idea in the externality of the natural world by giving its theoretical (philosophical) account. Yet Hegel's engagement with the philosophy of nature extends beyond its merely systematic or architectonic function. His interest is deeply rooted in the pursuit of formulating a comprehensive conception of nature that would explain it as an organic unity characterized by an intrinsic dynamic structure capable of self-generation.

Hegel expands his philosophical treatment of nature in his 1827 and 1830 editions of the *Encyclopaedia*. While his view of nature and his understanding of the aims of his philosophy of nature remain relatively consistent, notable revisions are introduced in successive editions of the work. One significant change is a marked shift in his understanding of the relationship between reason and the empirical world that occurred between 1817 and 1827 (Ferrini 1998). Additionally, specific concepts, such as chemism, undergo revisions in the later editions (see Houlgate 2005, 116–20; Houlgate 2022, 1:400n16). Furthermore, Hegel adjusts his elucidation of what John Burbidge calls "his account of the logic of nature" (Burbidge 1996, 96–102). His revisions take into account emerging scientific findings, leading him to acknowledge that empirical phenomena cannot be solely deduced through logical means. He recognizes that

understanding natural phenomena requires empirical exploration, observations, and experiential engagement, including scientific experiments. This shift in his perspective offers a more nuanced and justified position regarding the role of the empirical sciences in comprehending nature and its intricate processes. By incorporating empirical methods, Hegel's appreciation for scientific investigations becomes more substantiated and well-defined within his philosophical framework.

What undergoes even more significant alteration is largely the exposition of details (*Enc*. 2P, 1: 65). Significant textual expansions introduced in the 1827 and 1830 editions include additional chapters and elaborations on various topics in the form of Remarks. Hegel further develops and refines his ideas on physics, chemistry, geology, and organic life, offering a more comprehensive and detailed examination of natural phenomena. In the successive editions, he also takes into account advancements made in various scientific disciplines, such as astronomy, biology, paleontology, and geology. Along with making his work relevant to the scientific context of his time, it also led to some shifts in philosophical emphasis, such as more rigorously stressing the interconnections between the physical and organic aspects of nature, as well as highlighting the organic unity and continuity of natural processes.

It is noteworthy that for a number of consecutive semesters from 1819–20 to 1825–26, Hegel taught the philosophy of nature at the University in Berlin, a fact that demonstrates his continuing engagement with the subject matter.[6] In his *Lectures*, he discussed an impressive range of topics. In comparison, the *Encyclopaedia* includes only a few of them, mainly in Remarks. Still, the differences between the editions of the *Encyclopaedia* version of this part of his system reflect the persistent development of his thought in this area.

Consequently, the Philosophy of Nature offers a wealth of stimulating material that demands careful scrutiny and precise interpretation. A careful reading of this text reveals a fundamental coherence in Hegel's philosophical endeavor. Many themes and concerns introduced in the Philosophy of Nature resurface and find treatment in other works and aspects of his mature system.

Within the Philosophy of Nature, Hegel raises significant inquiries about the natural world and its dynamism, contemplating the extent to which scientific cognition can grasp its complexities. Additionally, he explores the relationship between philosophy and science, displaying a

[6] Recently published, Hegel's *Lectures on the Philosophy of Nature* provide valuable supplementary material, setting the stage for a more insightful philosophical exploration of Hegel's *Philosophy of Nature*. See: *VNat1-GW*; *VNat2-GW*; *VNat3-GW*.

keen interest in understanding their interplay. This engagement with nature and its scientific comprehension underscores the philosophical significance of Hegel's exploration in this area.

## 0.3 About This Volume

The primary goal of this collection is to demonstrate the genuine value of Hegel's philosophy of nature, not limiting it merely to its role as an intrinsic constituent of his system but also recognizing its profound significance as a well-developed, original account of the natural world that merits scholarly attention and urges a new and more insightful interpretation. However, this is not just another attempt to merely rehabilitate Hegel's project of the philosophy of nature. The task is to uncover its inherent vitality and show that Hegel's philosophy of nature can be thoroughly comprehended within the scope of a philosophical understanding of modern natural science, its objectives, and its results.

The *Encyclopaedia* Philosophy of Nature encompasses an exceptionally broad spectrum of themes and issues worthy of careful scholarly attention. The essays in this volume do not seek to provide an exhaustive analysis of every topic addressed by Hegel. Instead, their focus is directed toward an in-depth examination of some of the principal questions that Hegel delves into within his Philosophy of Nature and related texts. By concentrating on the central themes, the volume aims to shed light on the core ideas that constitute Hegel's philosophical framework in the realm of nature. This targeted approach permits a more focused and thorough exploration of the key concepts and insights that Hegel presents in his Philosophy of Nature.

The essays in this volume bring together various perspectives on Hegel's philosophical account of the natural world. They introduce novel queries, foster significant dialogues, and pave the way for insightful discussions that collectively hold the potential to extend beyond the confines of the book itself. This collective effort possesses the capacity to stimulate further constructive engagement with Hegel's philosophy of nature, thereby nurturing a further exploration of its intricate themes and implications.

The volume comprises a total of fourteen chapters, distributed among four distinct parts of slightly varying lengths. Part I, consisting of five chapters, serves as an introductory framework for the book's discourse. It sets the stage for the book discussion by putting Hegel's philosophy of nature into its historical and systematic context, and assessing it through lenses such as the conceptual paradigms of (methodological) naturalism, realism, essentialism, and physicalism. This part aims to provide a

foundational understanding of the intellectual landscape within which Hegel's philosophy of nature should be read.

Parts II and Part III, which include four and three chapters respectively, deal with specific themes that form the core of Hegel's deliberations within the *Encyclopaedia* Philosophy of Nature. These chosen topics are integral to comprehending his conceptual pursuits concerning such domains as mechanics, physics, and organics. The focus extends to unraveling the internal interrelations and dynamics that shape these domains.

Part IV, encompassing two final essays, addresses the question of the possibility of a future philosophy of nature and the contemporary challenges it confronts. By contemplating these future prospects and contemporary obstacles, the essays in this part engage with the evolving nature of philosophical inquiry into the natural world.

In our contemporary era, the relationship between humanity and the natural world has captured our collective consciousness in unprecedented ways. Within this context, Hegel's perspective on nature holds a distinctive position. Unlike other approaches that seek to explore nature as an isolated entity, Hegel is concerned with the intricate interplay between Spirit (largely correlated with humanity) and Nature. His philosophy delves into how humanity comprehends and interacts with nature.

Throughout history, the prevailing notion has been that our reliance on nature is primarily rooted in fulfilling our physical needs. However, a growing body of scholarly disciplines – ranging from theology to evolutionary psychology – has recently begun to question this perspective. These disciplines are exploring the possibility that the natural world might exert a significant influence on shaping diverse cultural forms. Could Hegel's ideas, or a reconstructed version of them, provide valuable insights for addressing this very task?

This collection ventures to offer an affirmative response to this question. Hegel's unique approach could provide insightful perspectives on the interplay between humanity and nature, acknowledging that this relationship extends beyond mere physical sustenance. Because Hegel not only scrutinizes *how* we relate to nature but explores what this relationship comprises, a reevaluation of Hegel and his ideas through a contemporary lens could indeed provide fresh insights into the connection between nature and the human cultural world.

Hegel's exploration of a wide range of topics, central to numerous philosophical and scientific disciplines, also means that fresh attention to these themes from a contemporary perspective will inevitably and significantly contribute to current discussions in these areas of investigation, promising novel insights.

PART I

# *Hegel's Philosophy of Nature in the Historical and Systematic Context*

CHAPTER 1

# *The Feebleness of the Concept in Nature*
## *A Challenge to Conceptual Realism?*

*Robert Stern and Leonard Weiss*

## 1.1 Introduction

Tackling issues in philosophy can sometimes feel like trying to get rid of a bump in the carpet – no sooner do you smooth the carpet down in one place, than a similar bump appears elsewhere. It could be argued that this is the situation with regard to debates about Hegel's idealism. In response to claims that Hegel is a kind of Kantian idealist according to which reality has a structure imposed on it by our ways of thinking, conceptual realists have argued that Hegel takes that structure to be inherent to the world itself, maintaining instead that on Hegel's account, individuals are instantiations of substance universals such as "horse" or "human being" which we come to know but which belong essentially to those individuals in their own right. Thus, it is claimed, Hegel is closer to Aristotle than he is to Kant, as he is an idealist not because he thinks we bring form to matter but because he recognizes the reality of conceptual structures such as laws and universals in the world, making his idealism a kind of anti-materialism that is also a type of realism, as it is in Plato and Aristotle.[1] However, critics of this conceptual realist reading have then countered that when we look at his philosophy of nature, Hegel speaks about the "feebleness of the concept in nature," which seems to allow for a good deal of indeterminacy in the way individuals are classified into kinds; and this then appears to reintroduce a role for cognitive subjects to impose an order onto nature as they see fit, rather than to uncover an order that is already there – suggesting that a more Kantian reading of Hegel's idealism might be right after all. So the bump in the carpet comes back.

[1] For a brief characterization of conceptual realism with further references, see Redding (2020, chapter 2.4) and Kreines (2015, 22n37). This reading of Hegel is also discussed in Stern (1990, 2009). Further examples of conceptual realist readings are deVries (1988, 1991), Westphal (1989, 2003), Stern (2013), Houlgate (2006), Kreines (2006, 2008), and Yeomans (2012).

It is this debate that we focus on in this chapter. We question whether the argument really works: From the fact that Hegel allows for limits to the taxonomic project, does it follow that the conceptual realist's interpretation of his position is flawed? And if this is the case, is the nominalist reading then correct, allowing for a more constructivist account of the natural order?[2] We begin by saying a little more about the conceptual realist reading and how it is said to differ from the Kantian one (Section 1.2). We then turn to consider how Hegel's account of the classification of nature in the *Phenomenology* and Philosophy of Nature has been used to raise problems for the conceptual realist reading (Section 1.3). We finally suggest how in fact nothing in what Hegel says about the problems in classifying nature threatens that reading, and everything he says about those problems can be made compatible with it (Section 1.4), as can his talk of the "impotence" of the concept in nature (Section 1.5). Of course, this is not a complete vindication of that reading – but hopefully it does enough to smooth out this particular bump.

## 1.2 Flattening the Bump: Hegel as a Conceptual Realist

As its name suggests, conceptual realism is a form of realism, in the sense of taking fundamental aspects of what there is to be mind-independent; but it is also a form of idealism, as what is said to be mind-independent in this way includes concepts or ideas, not merely what is material. This approach to Hegel then explains his important distinction between subjective idealism (which he associates with Kant, among others) and his own objective idealism as hinging on this issue: Whereas the former takes the cognitive subject to be the source of the order we find in the world, the latter treats that order as inherent to the world itself, which we uncover through our inquiries – but this still counts as a form of *idealism*, as what that order involves is not mere matter but matter informed by various conceptual structures, such as laws and kinds (what Charles S. Peirce was later to call "real generals").[3] These structures are ideal because epistemologically they are not immediately accessible in experience but require thought and inquiry to be revealed, while metaphysically they are not material but rather structure matter. While conceptual realism could take a Platonic

[2] We are using the term "nominalism" to refer to the view that universals are (1) mind-dependent concepts and therefore (2) do not carve nature at its joints. In the contemporary literature "nominalism" can be used more narrowly just to refer to the view that universals do not exist either in the world or in the mind. "Conventionalism" (or "constructivism") can be used as a label for (1) and/or (2) in this literature, whereas both these aspects are incorporated under nominalism as we understand it in this chapter.

[3] For the parallels between Hegel and Peirce here, see Stern (2009, 239–68).

form, placing what is ideal outside the world, it is argued that Hegel's conceptual realism is more Aristotelian, locating these ideal structures within it – so, for example, the natural kind of animal requires to be instantiated in individual animals (cf. *Enc.* 1BD §24 A; *Enc.* §367). Hegel's position on this issue is said to be expounded in his account of the concept in the *Logic* and its dialectical exposition (*WL GW* 12: 32–52/*SL* 529–49) of the categories of universality, particularity, and singularity.[4]

Focusing now just on the case of natural kinds, as this is the one most relevant to this chapter, it is suggested that Hegel adopts a variety of related arguments to defend his conceptual realism with regard to them, which might most simply be understood as arguments directed against a nominalist who disputes the mind-independent existence of such kinds. The aim is to show that the nominalist, due to their denial of objectively existing natural kinds, cannot account for the very individuals which they make central to their account. On this reading, Hegel is committed to three central arguments: Unless individuals exemplify kinds (1) there cannot be individuals at all; (2) there can be no necessary truths about individuals; and (3) there can be no normative truths about individuals.[5]

Given that all these arguments seem to be found in Hegel and given that they all appear to point toward conceptual realism, and given also that Hegel raises objections against various other forms of idealism (such as Kant's) which cannot be elaborated here, this then explains why conceptual realism as characterized here has arisen as a significant option in recent considerations of Hegel's position.

## 1.3 The Bump Comes Back: The Feebleness of the Concept and the Case for Nominalism

However, a number of recent publications (Bowman 2013; Wolf 2018; Lindquist 2020) question the adequacy of conceptual realist readings of Hegel by appealing to his philosophy of nature. In particular, it is claimed that Hegel's emphasis on the "feebleness of the concept" in the realm of animal life warrants the conclusion that he treats kinds not as objectively existing universals but as representing more or less artificial boundaries,

[4] For consistency with the translation by di Giovanni in *SL*, we use "singular/singularity" for "*Einzelnes*/*Einzelheit*" and "concept" for "*Begriff*." Throughout translations have been modified where necessary. Where reference is made to the *Encyclopaedia*, we have indicated the § number of the GW edition (*Enc.*) as well as the volume and page number of the relevant English translation (*Enc.* 2P, Enc. 1BD). Since *GW* 13, 19, 20 (= *Enc.*) omit the Additions/Zusätze, we have cited only the translation when quoting from this material. For comparison with the German text of the Additions, readers are advised to consult MM 8–10 or *GW* 23.3, 24.3.

[5] For further details of these arguments see Stern (2009, 354–58).

which in turn suggests that Hegel's notion of natural kinds is not robust enough to do the work that the conceptual realist requires it to do, showing that he is closer to nominalism. We now look at some of the relevant material in Hegel and the case that the nominalist builds on it.

### 1.3.1 *Hegel on the Feebleness of the Concept in Nature*

The context in which Hegel discusses the problematic status of natural kinds is a sort of modern "*Universalienstreit*" among then contemporary biologists.[6] The debate was about whether biological kinds and species make up a "natural system" which cuts nature at its joints, or if instead they are just useful constructions amounting to an "artificial system" of classification. In discussing these accounts Hegel highlights difficulties in establishing a natural system through the definition of generic terms: On the one hand it is hard to find properties that are unique to a specific kind so that they are exemplified exclusively by members of the kind. For example, while most fish do have fins, defining fish by virtue of this property makes whales a member of this kind, which is implausible regarding their similarities to land animals in other respects. On the other hand, it seems hard to find any list of properties that are exemplified by *all* members of a kind because in nature there are deviant cases ("monstrosities").

The point made by Hegel's nominalist readers is that the resulting difficulties in achieving a natural system are not merely the result of poor science but a consequence of the ontological structure of natural things. The fact that the kinds defined by scientists do not map neatly on to the natural world seems to suggest that nature is not governed by objectively existing universals, that there are no *natural* kinds to be found but only more or less useful constructions to be made. And indeed, on several occasions, Hegel appears to concede to nominalism what he calls the "feebleness of the concept in nature," thereby suggesting that in nature the "moments" of the concept (universality, particularity, and singularity) come apart.

For instance, with reference to the deviant instantiations of animal life mentioned earlier, Hegel says that there "are of course animals which cannot be clearly classified; the reason for this lies in nature's not having the power to remain true to the concept, and to coalesce neatly with the determinations of thought" (*Enc.* 2P §370 A, 3: 187).[7] The idea that

[6] On this debate cf. Mayr (1982, 172–85), on Hegel's reception cf. Heuer (2009).

[7] The section listed as §370 in the English translation (*Enc.* 2P) corresponds to §368 in the German edition (*Enc.* GW 20 viz. MM 9 for the Addition).

natural objects – by their very nature – are incompatible with a full realization of the concept not only leads to some isolated hard cases for taxonomists; rather, the division into kinds is compromised as a whole, because in nature the order that the concept suggests is afflicted by contingency. As Hegel points out, this is especially true of "the animal world" which is

> perhaps even less able than the other spheres of nature to present an immanently independent and rational system of organization, to keep to the *forms* which would be determined by the concept, and to preserve them in the face of the imperfection and mixing of conditions, against mingling, stuntedness and intermediaries. The feebleness [*die Schwäche*] of the concept in nature in general, not only subjects the formation of individuals to external accidents, which in the developed animal, and particularly in man, give rise to monstrosities, but also makes the genera themselves completely subservient to the changes of the external universal life of nature. (*Enc*. §368 R/*Enc*. 2P §370 R, 3: 179)

This basic conception of nature as *external* to a full realization of the concept is also conveyed in the *Science of Logic:*

> This is the impotence [*die Ohnmacht*] of nature, that it cannot abide by and exhibit the rigor of the concept and loses itself in a blind manifoldness void of concept. We can *wonder* at nature, at the manifoldness of its genera and species, in the infinite diversity of its shapes, for wonder is *without concept* and its object is the irrational. It is allowed to nature, since nature is the self-externality of the concept, to indulge in this diversity. (*WL GW* 12: 39/*SL* 536)

According to the nominalist interpretation mentioned earlier, these passages suggest that Hegel is no conceptual realist regarding natural objects; on the contrary, it is argued, Hegel explicitly embraces a form of nominalism according to which the attribution of kinds to nature is the result of our subjective activity, rather than a matter of "reason in the world":

> We want to know the nature that really is, not something which is not, but instead of leaving it alone and accepting it as it is in truth, instead of taking it as given, we make something completely different out of it. By thinking things, we transform them into something universal; things are singularities however, and the lion in general does not exist. We make them into something subjective, produced by us, belonging to us, and of course peculiar to us as men; for the things of nature do not think, and are neither representations nor thought. (*Enc*. 2P §246 A, 1: 198)

This and the other passages quoted here form an important background for the new nominalists, who argue that the complete interpenetration of reason and world which Hegel advocates cannot be meant to apply to the sphere of nature. We now turn to how exactly critics use them to construct

an argument against conceptual realism and make the case for a Hegelian nominalism.

### *1.3.2 The Case for Nominalism*

Starting from Clark Butler's "view that Hegel is a conceptualistic nominalist, not an essentialist" (1985, 125), Brady Bowman argues that it "may well be that substance-kind universals like 'lion' do not in fact exist *in re*, *pace* Stern and Aristotle" (2013, 144). While Bowman concedes that Hegel is not "a nominalist in the traditional sense," he does maintain that "the robust existence of universals like 'lion' or 'rose' is compromised by metaphysical deficiencies in the finite sphere of nature. Nature falls short of the concept partly owing to its poor nomological behavior, which in turn conditions the degree to which real universals are present and identifiable in it" (Bowman 2013, 145). Similarly, Wolf (2018) constructs an argument against conceptual realism from Hegel's interpretation of the ontological stature of nature. Conceptual realists, Wolf argues, claim that the Hegelian concept somehow *constitutes* things – either as a monist source that "deploys" finite reality (Taylor 1975, 300), or as an inner essence that renders things explicable (Kreines 2015, 7–12 and *passim*), or as a "substance-kind" that accounts for the structure of the object (Stern 1990, 73–76). But given this commitment, how do conceptual realists make sense of Hegel's claim that in nature things do not fully comply to their putative inner, conceptual core? For instance, "on Kreines's essentialist account, it is curious why the ontic concepts that are supposed to function as explanatory reasons should fail to account fully for things. It seems destructive of the realistic view of essences to put a distance between the essence and the thing or to find a defect on the part of the essences themselves" (Wolf 2018, 343). Thus, Wolf concludes, either we have to see Hegel in more Platonic terms and admit that universals are not really immanent to things but have some sort of separate existence; or we have to admit that the correct location of universals is the mind, not the world, as then "it is easy to see why some part of reality might fail to conform, since the concept itself does not stand in an originative relation to that reality" (Wolf 2018, 343).

Most recently, Lindquist expresses his contention that "uses of Aristotle to illuminate Hegel [are] problematic" because "Aristotelian 'natural kinds' take the form of dichotomous divisions of each higher genus into lower species" while "Hegel's taxonomic categories explicitly *overlap*" (Lindquist 2020, 431). Lindquist acknowledges that according to Hegel, the

definition of kinds must somehow be rooted in "differences which matter to the animal" (Lindquist 2020, 440). But he argues that this does not constitute a commitment to an immanent, ontological structure in nature but merely refers to an ontologically noncommitted adequateness of sortal terms. In face of these considerations Lindquist argues that Hegel is neither a nominalist nor a realist but should be "properly thought of as a sort of 'species-constructivist'" (Lindquist 2020, 439). But while Lindquist stays neutral on the thorny question of Hegel's realism, he builds his "constructivist" reading on the same concern about the "impotence of nature" raised by nominalist readers and concludes that according to Hegel "we have to construct our systems of nature because nature herself is too weak to do so" (Lindquist 2020, 439).

Thus, while the opposition to conceptual realism comes in two flavors – an ontologically committed nominalist one and an ontologically neutral constructivist one – we have seen how both variations gain their thrust from Hegel's appeal to the "impotence" and conceptual "feebleness" of nature and his analysis of the difficulties involved in biological taxonomy. The challenge for the conceptual realist is then to demonstrate that these elements of Hegel's theory are compatible with the interpretation of kinds as objectively existing, immanent universals, which is the aim of the subsequent sections of this paper.

## 1.4 The Realist Rejoinder: What Bumps?

We now consider the two central nominalist objections. First, on Hegel's account there is no objective system of natural kinds to be found in nature, due to the "feebleness of the concept" in the realm of animal life, which therefore consists in more or less artificial boundaries. Second, it therefore follows that no appeal to kinds can be made in thinking about the essential nature of individuals, in the way the conceptual realist claims. Our response to these challenges is twofold: In Section 1.4.1, we argue that, despite appearances, Hegel is quite positive about the possibility of finding a workable conception of kinds. In Section 1.4.2, we argue that nominalist interpreters reject conceptual realism on the basis of a misunderstanding concerning Hegel's appeal to immanent universals. Moreover, by providing a more nuanced discussion of Hegel's appeal to natural kinds, we demonstrate that the "impotence of nature" is indeed compatible with realism about universals in nature (Section 1.5). Thus, what appeared to be bumps will turn out to be mere shadows once examined in the light of further analysis.

### *1.4.1 Finding Kinds in Nature*

While it is true that Hegel believes nature cannot perfectly realize the concept, he also points out that some of the issues with finding a system in nature are homemade problems of then contemporary science. His extensive critique of the latter, in the *Phenomenology's* "Observing Reason" chapter, argues that the emaciated epistemology with which observing reason operates means it fails to properly theorize the knowable structure of natural objects and their relations.

Initially, approaching nature in the mode of observation and description seems to yield a theory-neutral representation of the object. However, as Hegel notes, the observing mind of a scientist also aims for *generality* in its findings.[8] Thus it will "without further ado admit that it is in general not that much concerned with perceiving, and that, for example, the perception that the penknife lies next to this tobacco-box will not count for it as an observation. The meaning of what is perceived should at least be that of a *universal*, not a *sensuous this*" (*PhG* 139/*PS* 144). In fact, Hegel argues, the observational approach always already involves some sort of universality that cannot be traced in sensory impressions as such; for despite its predilection for the realm of "tasting, smelling, feeling, hearing, and seeing [. . .] it has no less essentially already determined the object of this sensing" (*PhG* 139/*PS* 144).

Thus, observing reason's characteristic denial of theory-ladenness doesn't change the fact that any description of an object always already deploys at least some basic universal ideas that are not immediately present in the sensory manifold of empirical material. While pretending to have an interpretation-free interest in the object, the observing mind always already processes perceptive input found in nature and makes a "distinction between the *essential* and the *inessential*" (*PhG* 140/*PS* 145). But in doing so, the allegedly neutral observing mind brings its own notions of distinction into the object and so betrays "that what is at issue essentially has to do at least as much with *itself* as it does with things" (*PhG* 140/*PS* 145). This, in turn, brings about a nagging doubt about the appropriateness of the knower's account of the object to the object's mind-independent reality: There is a "wavering back and forth about whether what is essential and necessary for *cognition* can also be said to be in *the things*" (*PhG* 140/*PS* 145; cf. *Enc.* 2P §246 A, 1: 201). According to Hegel this

[8] As Hegel elsewhere puts it: "physics contains much more thought than it will either realize or admit" (*Enc.* 2P Introduction A, 1: 193).

hesitation is well justified for he suspects that the universals operational in the sciences of his time are indeed foreign to the so characterized, natural things.

Not only does the empiricist self-misunderstanding of science overlook its own use of universals; in as much as observation *does* involve the use of generic terms, the form of universality with which it works is also severely impoverished. This version of universality (which Hegel calls "abstract")[9] is generated through the selection of properties that are common to groups of objects. As Hegel makes clear, the appeal to such *abstract* universality is precisely what brings about the failure to capture the natural order. On the one hand, kinds usually have members that do *not* exemplify features that are statistically normal among the group (cats are usually furry but there are some furless specimens that are nonetheless cats). On the other hand, it is difficult to identify exclusive features exemplified by members of one kind only (cats are carnivore quadrupeds with retractable claws – but so are tigers and foxes). Consequentially, the procrustean method of dividing nature through abstract universals leads to a mismatch between the wealth of natural forms and the order attached to it by observers. In Hegel's eyes, this mismatch occurs not because nature has no conceptual structure but because the concepts applied to it "silence the universality it has reached, and which set it back again to unthinking observing and describing" (*PhG* 141/*PS* 147).

A similar concern is at work in Hegel's engagement with biological taxonomy in the *Encyclopaedia*. Here Hegel argues that most taxonomists of his time deployed the method of reducing essential characteristics of kinds to properties commonly shared among their members. In this way, he claims, taxonomists appeal to a form of generality that is alien to nature:

> The method used by research which has as its object the classification of animals, is to look for the common element to which the concrete forms can be reduced, i.e., for a simple sensuous determinateness, which moreover is also an external one. There are no such simple determinations however. For example, one might accept the general concept "Fish," as the common element of what one includes under this name when one thinks about it, and then enquire as to the simple determinateness or objective characteristic of fish. The conclusion to be drawn from this enquiry would be that fish swim in water, but as a number of land animals also do this, it would be insufficient. What is more, swimming is neither an organ nor a formation; it is a mode of the activity of Fish, and in no respect is it part of their shape.

[9] In brief: According to Hegel, abstract universals are merely common to many instances, whereas concrete ones determine their own variations. For more on this distinction see Stern 2009, 143–76.

> Simply as a universal, a universal such as fish is not bound in any particular mode to its external existence. If one now assumes that a common element must be present as a simple determinateness, such as fins for example, and such a determinateness is not to be found, classification will be difficult. In this classification, the features and habits of the individual genera and species are used as the basis and rule, but the untrammelled variety of life in this genera and species does not admit of any universal feature [*lässt aber nichts Allgemeines zu*]. (*Enc.* 2P §370 A, 3: 180)[10]

This last-mentioned universality, which Hegel says is not allowed for in nature, is the abstract universality used in observations and descriptions, which is statistical in approach and which overemphasizes the role of common properties. The corresponding genus-notions are much too rigid and cannot do justice to nature's complexity. However, it is important to recognize that Hegel is not saying here that *no* system of genera can be found in nature, as the nominalist might claim: For, he argues, a more sophisticated type of universal may be able to perform better and do without the overly sharp boundaries taxonomists seek to define. "Thus, a universal like fish" is being misunderstood if we were to make a list of observable features that are necessary and sufficient in order to define "X" as a fish and to exclude "Y" from the fishy kind. This approach fails because it deploys concepts that are too rigid for nature and so yields a crude and arbitrary "map of the world."

Thus, Hegel's point is directed not at universality per se but at the abstract universality achieved through the selection of common features which is inadequate for the type of generality sustained by living things.[11] More specifically, Hegel argues that the observable properties exemplified in an individual should be viewed as the result of an underlying *activity* which determines the kind to which the individual belongs. Universality that is "concrete" in this sense pertains primarily to the sort of life an animal lives and only secondarily to the properties it exemplifies in the course of doing so. It is important to note that this concrete universality is compatible with a wide range of qualities and cannot be reduced to any definitive list of properties. At the same time, individuals that share a similar type of inner activity and so live a relevantly similar life may indeed tend to have *typical* surface-properties. But the nature of their kind can be

[10] In MM 9 this section is numbered as §368 Z, and the quotation comes from pp. 502–3.

[11] This is why care has to be taken with the passage quoted above (*Enc.* 2P §246 A, 1: 198): When read in context it becomes clear that Hegel is not endorsing a subjective view of universals but rejecting it as a one-sided option to which a realist account of universals is to be preferred.

expressed in different ways, so that any attempt to directly conclude from the resultant properties to the underlying genus-specific activity is bound to fail.

Moreover, Hegel thinks that in some respects biologists of his day did show awareness for this type of process- and activity-related universality. Most notably, researchers such as Carl von Linné and, to an even greater extent, George Cuvier took an interest in properties insofar as they are connected to the functional organization of living beings. That way, their approach can be seen as at least partly moving away from the purely observational interest in properties as convenient signs for knowers. What they are moving toward is, by contrast, an interest in how such properties matter to the living beings themselves characterized in this manner. Although Linné championed a version of the property-based account of classification criticized earlier, Hegel traces a "sound instinct" in his choice to take the distinguishing marks of kinds from the "teeth, the claws etc." (*Enc.* §368 R/*Enc.* 2P §370 R, §370 R, 3: 178). Hegel finds this choice remarkable because, according to his interpretation, it betrays an implicit understanding of the functional roles of features and how they work toward the maintenance ("reproduction") of an animal's specific way of life.

As Hegel argues, kinds acquire reality not merely "in general" but through the individuals that are their members. Part of the activity of self-preservation that these individuals perform is that they relate to the world around them, such that they survive external influence without losing their characteristic form. This self-maintenance in the face of otherness is something animal individuals orchestrate through specialized parts of their bodies – such as their claws and teeth – that serve for fighting back predators or rivals, or for catching prey. Thus, Linné touched upon a relevant aspect of animal life when he suggested taking the distinguishing properties "from the animal's weapons." For it is through them that "that the animal, in distinguishing itself from others, establishes and preserves itself as a being-for-self" (*Enc.* §368 R/*Enc.* 2P §370 R, 3: 178).

It is significant to note that this is not only relevant for the problem of individuation but also for the question of how to differentiate kinds from one another. In order to know a kind as different from another one, Hegel suggests, it is important to know how its members are geared to supporting a typical way of relating to the outer world. In this respect, pointing, for example, to the claws of tigers and the beaks of birds is not entirely external to the inner activity or life of entities classified in that way. On the contrary, this choice betrays an "instinct" for how living organisms realize their kind in maintaining a characteristic way of being.

To be sure, Hegel's point is not that Linné had deliberately chosen this sort of functionalist, teleological approach. Rather his interpretation is that – despite Linné's faulty appeal to descriptive properties – an unconscious but "sound instinct" brought about the previously discussed focus on the self-preserving capacities of animals. A more explicit appeal to this train of thought is identified by Hegel in the works of Cuvier. Cuvier's big discovery, as Hegel sees it, is his holism about animal organisms. Cuvier turned away from the idea that isolated features could determine the kind of an individual and instead embraced the view that kind-specific characteristics can only be found in the whole composition of the organism: "particular importance has been attached to the *habit* [*Habitus*] of the individual forms, which has been regarded as a coherence [*Zusammenhang*] determining the construction of *every part*" (*Enc.* §368 R/*Enc.* 2P §370 R, 3: 178). This "coherence" points to the idea of a specific, underlying activity governing the exemplification and composition of features.

The reason why Hegel finds Cuvier's approach more interesting than conventional observation is its turn away from regarding observable properties as immediate expressions of a kind-specific essence. On the perspective Hegel reconstructs as Cuvier's, an observable feature of an animal is not informative as such but only in the context of an overall arrangement of characteristics that, in their totality, bespeak the kind-specific way of life of the individual. The idea that Hegel connects with these discoveries is that animal life follows patterns of organization that betray a purposeful activity, the life typical for a specific kind of animal.

On a fundamental level, he argues, there is a basic pattern common to all animal life. This so-called general type is characterized by the arrangement of functions toward self-preservation ("reproduction"). As such, the basic pattern of animal life, the Goethe-inspired "Urtier," does not exist. What *does* exist, according to Hegel, are various modifications as particular ways of realizing the basic end of self-preservation: "There is only one animal type, and all animal difference is merely a modification of it. [. . .] The universal type which forms the basis cannot exist as such of course; but the universal, because it *exists*, exists in a *particularity*" (*Enc.* 2P §370 A, 3: 181–82). These modifications of the general type represent what we call kinds or species. Knowing their differences means knowing in what ways different types of animals achieve a self-preserving form through the coordinated ("harmonic") arrangement of functional properties: "The organism is alive, and its viscera are determined by the concept, although it also develops entirely in accordance with this particularity. This particular determination pervades all the parts of the shape, and harmonizes them

with one another" (*Enc.* 2P §370 A, 3: 182). Studying the way animal organisms are built can lead to understanding in what specific way they achieve functional tasks (such as processing sensory input or reacting to external influences) in order to "reproduce," that is, to preserve their way of life. Difference on the level of kinds arises through different ways of doing so.

More specifically, Hegel argues that there are two ways in which kinds differ in their specific modification of the general type. They exhibit (1) *different levels of complexity* in the sense that some have primitive "all-rounder organs" while members of more advanced kinds possess specialized organs for fulfilling sensory, nutritive, and other tasks. This type of modification reflects the *degree* of organization and lies at heart of Cuvier's approach. On the other hand, there is also (2) *a modification of the general type according to the environmental conditions that animals face*. For instance, animals that live in water require a motor system that differs from that of animals that live on land. In fact, their whole bodies will have a different design that is required to maintain life under exactly these living conditions. This is the kernel of truth that Hegel grants to Linné's idea that the claws have something to do with the characteristics of a genus: They reflect the individuals' active engagement with their specific environment and as such their "outward orientation toward a determinate inorganic nature" (*Enc.* 2P §370 A, 3: 182). However, Hegel maintains that the relevant target is not an isolated feature like having such and such claws or legs etc. but the overall harmony of functions that such parts serve.

In conclusion, Hegel accepts two basic laws of division: (1) *the degree of complexity in the arrangement of functional properties* and (2) *the adaptation of such features to specific living conditions*:

> Two principles are therefore effective in determining the difference between animal genera. The first principle of classification, which is closer to the Idea, is that each subsequent stage is merely a further development of the simple animal type; the second is, that the organic type's scale of development is essentially connected with the elements into which animal life is cast. (*Enc.* 2P §370 A, 3: 181)

It is true that Hegel did not establish a biological classification along these lines; but what he does say about the principles of division is enough to see that a natural system would have to differentiate kinds according to the overall patterns of organization inherent to their members and acknowledge that the specific execution of such patterns is subject to contingent, external influence. This latter element, the role of contingency, explains

why the inner, concept-governed structure can never be realized in an unadulterated, ideal way. But at the same time, this is not to say that there are no inherent and knowable structures in nature at all. All Hegel says is that these structures cannot be grasped through exact lists of properties common to all members of a kind.[12]

### *1.4.2 Kinds as Essences*

Hegel's conviction that abstract universality cannot be traced in nature is thus not to be confused with the nominalist claim that there are no universals to be found at all. As we have seen, while Hegel is critical of the prospects of a nonarbitrary taxonomy based on observable properties, he is more positive regarding taxonomies based on a deeper conception of universal kinds, so in this respect his position is compatible with essentialism. However, we now turn to address a second challenge, which claims that these kinds cannot be essential to individuals in nature, as it is impossible for them to be properly realized in this domain. In response, we show that Hegel's teleological account of immanent universals is compatible with nonideal instances of kinds and can still accommodate the idea that these kinds are essential to their instances even if these individuals realize them imperfectly.

The fact that in nature imperfection is ubiquitous may be regarded as a challenge to *any* account of objectively existing universals in nature – both abstract or concrete. As we have seen, it has thus been argued by nominalists that because things in nature fail to correspond to "their" kinds on a regular basis, it is hard to see these kinds as constituting immanent essences determining the reality of these things. What realists mistake for immanent essences are said to be just *our* more or less appropriate conceptions of things so that concepts "can conform to reality more or less" and things can be more or less appropriate to (what we stipulate as) their concepts.

But upon closer examination this does not constitute a convincing argument against conceptual realism. In order to understand why, we need to remind ourselves of the fact that Hegel's essentialism is teleological in character. As Hegel sees it, the genus-concepts forming the immanent universals of things are to be understood as "their determination and purpose" (*Enc.* §179/*Enc.* 1BD: 253; cf. *Enc.* 2P §245 A, 1: 196).

[12] In the context of contemporary philosophy of biology, this position would seem to resemble Richard Boyd's homeostatic property cluster theory of natural kinds (cf. 1991, 1999).

On this view, concrete, individual oak trees are seen as realizations of a preexisting goal-structure determined by the natural kind "oak tree."[13] As deVries (cf. 1988, 8) points out, such goal-directedness relies on the idea that the goal is, in some sense or other, ideal or good, a standard that ought to be realized in one particular way rather than another. But, as he also makes clear, this does not mean that such a standard is always perfectly met. Objective purposes, just like the intentional ends of agents, are approximations to a goal that is achieved in higher or lesser degrees of perfection. The teleological character of Hegel's essentialism thus makes it possible to reconcile individual imperfection with the assumption of immanent universals as immanent essences: Such essences do not have to be realized in full perfection, rather it is intrinsic to their teleological character that they constitute immanent goals that can be achieved to various degrees of perfection (cf. *WL GW* 12: 213–14/*SL* 712).[14] As Hegel himself puts it, the "finitude [of things] consists in the fact that their particular [character] may or may not be adequate to the universal" (*Enc.* §179/*Enc.* 1BD: 253). Such finitude, however, is not a sign of the absence of universals in nature. Quite to the contrary, natural things are regarded as finite precisely *because* they have inner standards which they can fail to live up to; and as mentioned earlier in Section 1.1, it was always part of the conceptual realist's case that the substance universal provides a normative standard in this way, making this a feature of the position rather than a bug.

That being said, nominalist readers may want to retort that Hegel's remarks about the "feebleness of the concept in nature" do not only pertain to individual imperfections but also to the very standards individuals (arguably) strive to realize. For example, Hegel writes: "The feebleness of the concept in nature [. . .] not only subjects the formation of individuals to external accidents [. . .] but also makes the genera themselves completely subservient to the changes of the external universal life of nature" (*Enc.* §368 R/*Enc.* 2P §370 R, 3: 179). It might appear that Hegel believes

[13] Rejecting a Kantian account of purposes as mere aids for our reflection, Hegel says that to the extent that we recognize the inner goal structure of things as their universal content, "[t]his universality of things is not something subjective and belonging to us; it is, rather, the [. . .] objectivity, and actual being of the things themselves" (*Enc.* 2P §246 A, 1: 200).

[14] This has also been noticed by Knappik, according to whom Hegel holds the view that the concepts of living things "come with standards that individual organisms and persons aim to live up to." While "these standards are defined by sets of individually necessary properties [. . .] which are required for a full realization" of a kind-specific concept, Hegel, according to Knappik, "emphasizes" that individual exemplars "can fall short of such full realization" (Knappik 2016, 772).

that in nature not just individuals but also the standards themselves (genus-concepts such as "oak tree" and "lion") are affected by the feebleness of the concept. This, and other remarks by Hegel in similar a spirit, can be accommodated within a nominalist account of universals. However, a nominalist interpretation is not the only way to make sense of what Hegel says here and given the overall textual evidence for conceptual realism it is not the most convincing one either.

In order to distinguish and then evaluate both readings, consider the following scenario. Suppose the essence of the kind "oak tree" includes that its members grow flowers in spring that develop into acorns when pollinated. Now suppose we find a tree that follows the overall organizational patterns of oak trees but won't grow any such flowers. It may seem that this tree could either be classified as a poor example of the kind "oak tree" or as an instance of the different kind of "noak trees," for which it is not essential to grow acorn-producing flowers in spring. In the latter case, it is not that the tree fails to realize the standard determined by the kind of oak trees; there is nothing wrong with it, it simply realizes different standards determined by a different genus concept.

Now, a nominalist would analyze this scenario as follows: Because nature does not contain either of the kind-concepts of oak trees or "noak trees," it is up to us to decide whether we are faced with a poor oak or with something entirely different, such as a "noak tree." Since nature is governed by contingency, the decision is a matter of the subject's choice instead of the world's own structure. However, from the standpoint of conceptual realism, things look different: Since the standards things aspire to realize are objective and immanent to natural things, it cannot be arbitrary whether something is a bad oak tree or rather a member of a different kind. For each and any such decision there must be an objectively correct way of analyzing some individual as either a defective instance of a kind or as a member of a different kind.

The question is whether such an appeal to a definitive division of natural kinds is compatible with what must be acknowledged as Hegel's claim that biological kinds are affected by contingency. In order to make this decision we have to examine the way in which Hegel believes the concept is realized in nature, that is, his account of the idea of life. The concept, says Hegel in this context, "is the impulse that gives itself reality through a process of objectification" (*WL GW* 12: 180/*SL* 677). Life as a logical category describes such realization in terms of an unadulterated self-relation of the concept. In nature, however, this impulse is not purely conceptual but conditioned by contingent, for example environmental, factors:

> As treated in the philosophy of nature, as the life of nature and to that extent exposed to the *externality of existence*, life is *conditioned* by inorganic nature and its moments as idea are a manifold of actual shapes. Life in the idea is without such *presuppositions*, which are in shapes of actuality; its presupposition is the *concept*. (*WL GW* 12: 180/*SL* 677)

For the type of beings that enjoy *natural* life, what it means to realize their immanent standard is not to realize a pure ideal but something more mundane: a compromise between the perfect self-relation of the concept and the conditions of contingent existence. What Hegel says in this passage implies that the realization of universals in nature has contingent presuppositions. But saying this is a way of explaining the existence of universals in nature, not a way of denying it. The fact that natural kinds are, in part, conditioned by contingent factors does not allow an inference to the claim that they are nonexistent. Far from claiming the absence of immanent universals in nature, Hegel puts forth the idea instead that the reality of these universals is conditioned by contingent factors. This view is also operative in the Philosophy of Nature where Hegel says that "one side of it [nature] is formed by the conceptually generated necessity of its formations and their rational determination within the organic totality, and the other by their indifferent contingency and indeterminable irregularity" (*Enc.* §250/*Enc.* 2P 1: 215). As he goes on, the "impotence of nature is to be attributed to its only being able to maintain the determinations of the concept in an abstract manner, and to its exposing the foundation of the particular to determination from without" (*Enc.* §250/*Enc.* 2P 1: 215). This shows that by the "impotence of nature" Hegel means that the concept is not fully autonomous in nature but not that it is absent from it. The true upshot of what Hegel says here is that the realization of universals in nature is a joint venture (so to speak) between the conceptual core of actuality and its contingent reality. But the fact that universals such as "lion" and "oak tree" are shaped partly by contingent factors does not make them unreal. Thus, there is no need to depart from what is generally Hegel's view, namely that reason is a feature of the world and not just of our thinking.

This interpretation also aligns well with what Hegel intimates about the division of biological kinds. Considering the Janus-faced character of essence in nature, Hegel recommends the joint application of "[t]wo principles [. . .] in determining the difference between animal genera" (*Enc.* 2P §370 A, 3: 181). One principle directly concerns the universal form of animal life: The essence of an animal kind is characterized by a form of self-realization which constitutes its purely conceptual structure.

The other "is, that the organic type's scale of development is essentially connected with the elements into which animal life is cast" (*Enc.* 2P §370 A, 3: 181). As such, the purposes that self-realize in nature are partly conditioned by contingent factors. Thus, it could be that some oak trees develop in a way that means they can no longer reproduce, in which case they would be defective members of the kind; or they could develop to have a different way to reproduce themselves, in which case it might make sense to classify them as "noak trees" instead. But either way, it would be wrong to conclude that this made the kind they exemplify either nonimmanent to the things it ensouls or unintelligible to knowers who thoughtfully observe them.

However, despite the responses we have given to the nominalist challenge, a concern may still remain surrounding Hegel's talk of the "impotence" of nature and the way in which it is "concept-less" (cf. Wolf 2018, 342). In Section 1.5, we acknowledge that there is one further dimension of Hegel's thinking here that we have not yet covered – but argue that while it does embody a criticism of nature from Hegel's perspective, it is not incompatible with the essentialist commitments we wish to attribute to him.

## 1.5 The Infinite Manifoldness of Nature

As we have seen, one passage that is important to the nominalist reading of Hegel on nature is the one where he speaks of "the impotence of nature" in the *Science of Logic*; and this may seem all the more challenging for the conceptual realist when it is cited in full:

> This is the impotence of nature, that it cannot abide by and exhibit the rigor of the concept and loses itself in a blind manifoldness void of concept. We can *wonder* at nature, at the manifoldness of its genera and species, in the infinite diversity of its shapes, for wonder is *without concept* and its object is the irrational. It is allowed to nature, since nature is the self-externality of the concept, to indulge in this diversity, just as spirit, even though it possesses the concept in the shape of the concept, lets itself go into pictorial representation and runs riot in the infinite manifoldness of the latter. The manifold genera and species of nature must not be esteemed to be anything more than arbitrary notions of spirit engaged in pictorial representations. Both indeed show traces and intimations of the concept, but they do not exhibit it in a trustworthy copy, for they are the sides of its free self-externality; the concept is the absolute power precisely because it can let its difference go free in the shape of self-subsistent diversity, external necessity, accidentality, arbitrariness, opinion – all of which, however, must not be taken as anything more than the abstract side of *nothingness*. (*WL GW* 12: 39/*SL* 536)

It is easy to think that in saying that the "manifold genera and species of nature must not be esteemed to be anything more than arbitrary notions of spirit engaged in pictorial representations," Hegel is confining genera and species to a way in which we choose to view the world rather than being features of how things are, thus undermining the realist case completely. However, we now suggest, while this passage does indeed tell us something significant about Hegel's views concerning the inadequacy of nature in certain important respects, this does nothing to undermine his commitment to essentialism – which we take to be an interpretative advantage of our approach to this passage, as this then makes it compatible with the many other passages in which Hegel seems to endorse essentialism, and which are highlighted by the conceptual realist (cf. Stern 2009, 26–27, 153–58, 354–58).

First of all, it is important to put this passage in context. It comes in the second subsection of the chapter on "The Concept" in Hegel's *Science of Logic*, where he is dealing with "The Particular Concept," having dealt with "The Universal Concept" in the previous subsection. By speaking of "particularity" here, Hegel does not mean singularity (which is the topic of the next subsection) but the division of a concept into particular types – for example, isosceles, scalene, and equilateral are particularizations of the universal "triangle," as these are the three ways in which something can be a triangle. As Hegel notes, there is thus an affinity here between how a universal relates to its particularization and how a genus relates to the species that fall under it.

However, in discussing this example of a triangle in his Introduction to the *Science of Logic*, Hegel claims that this division is

> not implicit in the determinateness of the triangle itself, that is, not in what is usually called the concept of a triangle, no more than in the concept of animal in general, or of mammal, bird, etc., one can find the determinations according to which animal in general is divided into mammal, bird, etc., and these classes are then divided into further genera. (*WL GW* 21: 44/*SL* 38)

Hegel argues that while "[s]uch determinations are taken from elsewhere, from empirical intuition," and so "come to those so-called concepts from without," by contrast when it comes to the "philosophical treatment of division, the concept must show that it itself holds the source of the determinations" (*WL GW* 21: 44/*SL* 38), which is what Hegel claims for his division of the *Logic* into Being, Essence, and Concept, and likewise elsewhere for other parts of his system, such as the division of beauty in art

into the three forms of symbolic, classical, and romantic (MM 13: 106–14/*LFA* 1: 75–81).[15] Similarly, in an example Hegel gives just before the passage we are discussing, he argues that there can be a complete division into two ways in which causality can manifest itself, namely as cause and as effect (*WL GW* 12: 38/*SL* 535).

Now, it is precisely at this point that Hegel draws a contrast with species in nature, as "there are more than two species to be found in any genus in *nature*, and these many species cannot stand in the same relation to each other as the one we have been discussing [*viz.* complete division]" (*WL GW* 12: 39/*SL* 536). The key contrast here, then, is a case where we can particularize a universal genus into species through an a priori process of complete division, and where we cannot – and the point Hegel is making here is that we cannot do this when it comes to nature, in a way that we can for the *Logic* and also for forms of art.[16]

It is this, then, that Hegel has in mind when he talks in our passage about the "impotence of nature," namely that it does not manifest the "rigor" of the concept in the sense it cannot be divided completely into species in this way, but instead each genus has many different particularizations, which makes nature manifold in a way that the categories of *Logic* and forms of art are not – there are only three divisions to those categories and art forms, but there are potentially endlessly many ways of being a parrot, a horse, or a human being, and we therefore cannot deduce these ways a priori, hence the "impotence" of the concept in these domains.

Moreover, Hegel warns here, we should not allow ourselves to be impressed by this manifoldness of nature and think it makes nature somehow superior to logical categories or art forms. On the contrary, while this manifoldness might lead us to *wonder* at nature, and enable it to appeal to our representational capacity, this manifoldness should be viewed more severely as a definite fault from a rational perspective, precisely because in all this exuberant diversity we do not find any real rational order, because there is no way to move here from the universal to its division into particular types in a complete and a priori manner; this makes nature an "unreliable copy" of the concept, which is beset by "self-subsistent diversity" (i.e., a diversity that does not itself come from the

[15] Hegel makes similar remarks regarding the division of all the parts of his system, including "the Idea of nature" into mechanics, physics, and organics (*Enc.* §252/*Enc.* 2P 1: 217).

[16] Hegel allows that when it comes to art, there may also be some difficulties in fitting everything into the systematic division into the types of individual arts (architecture, sculpture, painting, music, and poetry), and once more we should not allow ourselves to be impressed by this as again it betokens a kind of "impotence," just as it does in nature (MM 14: 262–63/*LFA*, 2: 627–28).

universality of the concept), thereby giving rise to "external necessity, accidentality, arbitrariness, opinion" (*WL GW* 12: 39/*SL* 536) in the kinds of diversity that are to be found. Nonetheless, Hegel reassures us, this does not mean that nature is wholly other than the concept, as the concept has the "absolute power" to let this exuberance of nature carry on without its being overcome, so that even in all this manifoldness, "traces and intimations" of the concept are still to be found in nature (cf. MM 13: 173–74/*LFA* 1: 129), though we must allow that nature would be *more* rational if this manifoldness were not so and everything in nature could be deduced from the concept. However, as Hegel argues elsewhere, the kind of contingency that leads to this manifoldness is itself essential to nature, and so in that sense it is something we can explain and should not surprise us.[17]

Now, if this is the right way to understand this key passage, where does it leave the conceptual realist? In our view, it leaves their position intact, as it is no part of conceptual realism that the individuals for whom kind membership is essential belong to kinds that can be deduced a priori. The essentialist claim is just that kind membership is essential to the individuals who belong to those kinds, not that these kinds can be deduced from some higher kind in an a priori manner. The essentialist can of course allow that this might be possible, as Hegel does in the divisions he offers in the *Logic* and in his aesthetics. But while it may possible in these cases, this does not mean when it is not, being a dog is any less essential to an individual; and when it is not possible, nor does this prevent Hegel stating that kind membership is essential, as we have seen.

As a result, therefore, we believe the conceptual realist can accommodate the claims that Hegel makes regarding how nature is problematic to reason in certain key respects, but without this undermining the central point that the conceptual realist wants to make, and thus without this undercutting its arguments against those who read Hegel differently. The carpet, it therefore seems, is flat after all.[18]

[17] Cf. Henrich's (1958) classic interpretation of Hegel's theory of contingency.

[18] We are very grateful to Brady Bowman, Franz Knappik, James Kreines, and Clark Wolf for discussion of their readings of Hegel on these issues, and to our Sheffield colleagues Luca Barlassina, Will Morgan, and Jerry Viera for good naturedly considering with us where Hegel might stand in relation to contemporary debates.

CHAPTER 2

# *Nature and Its Limits*
## Hegel's Idealist Critiques of Physicalism, Naturalism, and Essentialism

*Sebastian Stein*

> Time is a game played beautifully by children.
>
> Heraclitus, Fragment 79

It has recently been suggested that Hegel's notions of a mind-independent nature[1] and of a consciousness-external, "real" world imply that the labels of "essentialism" (Knappik 2016) and "naturalism" (Pinkard 2012) are suitable for describing his philosophical position. This is accompanied by discussions of Hegel's *Geist* as "second nature" (Khurana 2017; Wretzel 2020), an emphasis on Hegel's notions of "life" (Ng 2020) and immanent teleology (Koch 2019), and seemingly neo-Aristotelian interpretations of Hegel's metaphysics (Kreines 2015) and his practical philosophy (Novakovic 2017b). These readings mostly aim to contrast Hegel's philosophical stance with Kant's and Fichte's commitment to the alleged reduction of nature and objective reality to being a function of subjective mind. They also emphasize the objective status of Hegel's concepts that structure metaphysical, natural, and spiritual reality. Hegel has thus been labeled a "(Neo-)Platonist" and an "Aristotelian" "realist" because his "concept" is akin to objectively manifest, reality-structuring "natural kinds" (Knappik 2016, 762–63).

Against such labels and emphasis, it is argued in this chapter that realist, essentialist, and other naturalist readings risk not accounting for Hegel's decidedly post-Kantian, unapologetically idealist, and irreducible realm of *Geist* within which all nature is embedded, that is "sublated" (*Enc.* §381/*Enc.* 3I: 9). From the perspective of Hegel's indeterminacy-accommodating and thus supernatural realm of *Geist*, *Geist* is all there is: *Geist* is "the truth of nature" as nature has "vanished" (*Enc.* §381/*Enc.* 3I: 9) in it and been turned into *Geist's* objectivity.[2] Threatening to obscure this

[1] As for example in his philosophy of nature.

[2] While a sublation of nature into *Geist* does entail that at least in some sense, *Geist* does "not leave nature behind" (Wretzel 2020, 93), it undermines the notion that at the level of *Geist*, *Geist* is somehow grounded in or dependent on nature, as if nature were ontologically first and *Geist* second.

conceptual fact, the labels "naturalism," "realism," and "essentialism" risk an association of Hegel's absolute idealism with *Geist*-undermining physicalism and natural reductionism as well as with pre-Kantian substance and rationalist metaphysics.

While it is true that Hegel argues against Kant and Fichte in favor of an irreducibly "real" realm of "nature as such" rather than just of "nature for *Geist*," he still remains a distinctly post-*Kantian* philosopher of *Geist* about the conceptual structure of mind-related reality and denies that *Geist*'s unconditioned and indeterminacy-featuring, self-positing subjectivity can be explained with reference to a "realist," objective principle such as nature, substance, a cosmic ideas-oriented order, or a presupposed god (Stein 2018). Hegel might thus be a "naturalist" about "nature as such," but he is also a spiritualist about *Geist* while ultimately, he is an (absolute) idealist about both nature and *Geist*.

More precisely, given the architecture and labels of Hegel's encyclopedic system, the name "essentialist naturalist" is shown to imply that he is a physicalist reductionist due to the essence-like, mediation-centered position that physics takes within his philosophy of nature.[3] As an analysis of his philosophical account of physics illustrates, Hegel rejects physicalism on the grounds that its assumption of a difference between physical form and physical bodies sabotages an explanation of why form is able to define, guide, and give particularity to individual bodies in the way physics implies.

Furthermore, it is argued that even if the meaning of "naturalism" included all the categories of Hegel's philosophy of nature and thus also "Mechanics" and "Organics," his arguments about the sublation of nature into *Geist* and about *Geist*'s irreducibility imply that he would still reject the naturalist label. A discussion of nature's most concrete category, "the death of the individual" (*Enc*. §375/MM 9: 535), is used to illustrate how the category of "nature" assumes a difference between the particularity of

Describing *Geist* as a "second nature" that "is nature, too" (Wretzel 2020, 93) and thus thinking of it as a continuation of nature "by other means" (Wretzel 2020, 93) could be taken to suggest that *Geist*'s unity is ontologically dependent on nature's disunity in a manner that contradicts *Geist*'s irreducibility and Hegel's argument that on the level of *Geist*, *Geist* accommodates nature and is defined by a distinctly unnatural and supernatural, indeterminacy- and unity-based, self-determination (*Enc*. §381/*Enc*. 3I: 9ff.). This absolute status of *Geist* also applies in the context of Hegel's anthropology where the distinctly *geistige* and nature-accommodating *soul* ontologically embeds the seemingly "natural" elements that are sublated in *Geist* and are able to affect the soul because they are *Geist* as well.

[3] Hegel does at times loosely employ the term "essence" to rhetorically stress the realist dimension of his notion of the concept and its shapes (cf. Knappik 2016, 764). However, he argues in his *Logic* that "objective" (*WL SL* vii), essentialist notions of reality and thought are overcome by his concept-based ontology (cf. *WL SL* 504).

the individual organism's life and the death-inducing negativity of its genus' universality and therefore fails to explain the implied compatibility of the moments. Since nature ends in death but fails to explain how death is possible, Hegel would consider a "naturalism" that explains *Geist* and its explicitly eternal "life" (*Enc.* §389Z/*Enc.* 3I: 31) in terms of nature to be an inconsistent "philosophy of death."

The chapter ends with the argument that Hegel's absolute idealism would be mischaracterized if one were to subscribe to a more – and maybe the most – abstract sense of "naturalism" as "metaphysical essentialism." According to Hegel's *Logic*, essentialism is committed to the priority of an essential universal over an unessential particular and ends up undermining both. This also applies to essence-based descriptions of the relationship between a subjective mind and an objective world: According to Hegel, essentialist accounts of mind presuppose a "real" and objective, world-structuring principle and define mind's subjectivity as a function of such a principle. This undercuts the irreducibility of mind's subjectivity and thereby the objectivity of the privileged principle. In contrast, Hegel's concept-based idealism is designed to balance the mind's subjectivity and the world's objectivity without prioritizing or reducing either.

The chapter consists of three sections. Section 2.1 analyzes Hegel's critiques of physicalism and of narrow and wide naturalism. This shows that he would reject the labels "essentialist naturalism" as well as "naturalist essentialism" because the former fails to explain its assumed unity of physical bodies and form and the latter implies either an inconsistent general metaphysics of essence or an essentialist metaphysics of mind. Section 2.2 reconstructs and analyzes Hegel's critique of naturalist essentialism and argues that his concept-metaphysics seek to avoid an essence-based undermining of metaphysical particularity and of the mind's subjectivity. The chapter closes with the analysis in Section 2.3 of Hegel's absolute idealism that conceives of *Geist* and nature as irreducible variations of the concept-based idea, arguing that this makes him neither a naturalist nor a spiritualist but an idealist.

## 2.1 Hegel vs. Physicalism, Naturalism, and Metaphysical and Mind-Related Essentialism

### *2.1.1 The Philosophy of Nature and Logical Metaphysics*

What would it mean in Hegel's own terms to think of his idealism as an "essentialist naturalism"? Systematically, given physics' essence-style, conceptual concern with mediation that entails its positioning between

"Mechanics" and "Organics" within the Philosophy of Nature, for Hegel, "essentialist naturalism" entails a commitment to the absolute status of physics and thus to the notion that ultimately, all of metaphysical, natural, and spiritual reality can be explained in terms of the categories of physics.

Within the philosophy of nature, "Physics" parallels the *Logic*'s positioning of "essence" that is framed by the logic of "Being" and of "the Concept" because conceptually, both essence and physics are focused on relationality and mediation: While the logic of essence conceives of metaphysical truth as a relation between the essential and the unessential (*Enc.* §112ff./*ENZ* 123ff.), physics describe natural reality as a relation between form and material bodies (*Enc.* §245ff./*ENZ* 199ff.; *Enc.* §272ff./*ENZ* 231ff.). To Hegel, physics thus constitutes nature's essentialist moment. The following analysis of Hegel's account of the features of physics' categorial framework aims to reconstruct why he rejects physicalism as an account of fundamental truth by means of his characteristic philosophical method of a combined conceptual analysis and a *reductio ad absurdum*.

The more precise context of Hegel's engagement with physics and physicalism is located in his philosophy of nature. He there argues that physics defines the second categorial dimension of "nature," which itself constitutes the encyclopedic system's second part and describes the logical "idea" (*Enc.* §244/*ENZ* 197) in the form of "self-negation" (*Enc.* §247/*ENZ* 200). While the *Logic* constitutes the system's first part and critically deduces the constituent categories of the idea in its purely logico-metaphysical form and thereby defines the realm of metaphysical reality and intelligibility, the idea as nature does the same for the realm of natural entities and events.

Since the "idea of nature" is a variation of the *Logic's* "absolute idea," nature's philosophical description aspires to the same degree of "eternal" (*WL SL* 29; *Enc.* §258/*ENZ* 210) validity as the logico-metaphysical account of the logical idea. This makes the philosophy of nature a kind of metaphysics, albeit an idea-based and thus "idealist" metaphysics of nature:

> Nature is to be considered as a system of levels, where each follows onto the previous one with necessity and the latter is the truth of the former. But not in such a way that one is naturally created out of the other but that each is created in the inner idea that constitutes the ground of nature. (*Enc.* §249/*ENZ* 31)

### 2.1.2 *Philosophy of Nature and Natural Science*

Hegel's *philosophy* of nature thus aims to define and deduce only those categories that he thinks follow from the internal logic of the concept-based, metaphysical idea in its natural form (*Enc.* §251/*ENZ* 204).

While the empirical and natural scientific definition and discovery of nature's categories may and often does historically precede their philosophical definition and deduction, the philosophy of nature lays claim to focusing on and deducing only those unconditioned categories that structure and enable natural science and natural reality. While their philosophical presentation and deduction empirically presupposes that the philosopher "thinks through" science and its engagement with empirical reality, the philosophically discovered categories do not *conceptually* rely on empirical reality and science because they are what enables empirical reality, thought, and science in the first place (*Enc.* §246/MM 9: 15). Hegel's philosophy of nature thus aims to show that there is an empirically unconditioned and conceptually necessary sequence of independent, intelligibility- and reality-defining categories that ground and structure nature – and the philosophical categories of physics form part of this project (*Enc.* §246/MM 9: 15).

### *2.1.3 The Structure of Nature*

Hegel then subdivides his philosophical account of nature into the three moments: "Mechanics," "Physics," and "Organics" (*Enc.* §252/MM 9: 37). The most abstract moment, "Mechanics," defines the foundation and abstract categorial presuppositions of physics. Insofar as mechanics' notions of "individual bodies" and "form"-representing "gravity" are sublated and thus integrated into physics, they supply a foundation for physics.

More precisely, Hegel argues that mechanics is nature "[i]n the determination of externality, of infinite individuation, outside of which the unity of form is merely in itself and thus only as an ideal, and as something that is sought. [Mechanics] is matter and its ideal system" (*Enc.* §252/MM 9: 37).[4] Mechanics thus defines nature as a manifold of spatio-temporal (*Enc.* §253/*ENZ* 206), material entities (bodies) that repulse and attract each other; that have weight, transmit movement, and strive toward a center of gravity. It thus prioritizes the individuality of bodies over any notion of their formal unity so that unity remains something added to the weighty, individual bodies and is striven for in the form of a *center of gravity* that is never integrated into the bodies (*Enc.* §270/*ENZ* 224–25). Hegel argues that this assumed difference between bodies, bodies and weight, and bodies and the center of gravity prevents mechanics from explaining *why* the bodies are heavy, why they are able to relate to each

[4] All translations are by the author unless stated otherwise.

other, and why gravity has an effect on them: If, by assumption, the individual bodies differ from each other and from the formal dimensions of weight and gravity, why can they interact with these? According to Hegel, mechanics' inability to answer this conceptually inevitable question disqualifies it as an account that could exhaust nature. Instead, its shortcoming motivates the more concrete categories of "Physics" and thus the main categorial framework of "essentialist naturalism."

### *2.1.4 Hegel on Physics*

According to Hegel, physics describes nature in "the determinacy of particularity, so that reality is defined with immanent formal determination and a difference that exists as a part of it. Physics is a relation of reflexivity, where natural individuality constitutes its being-in-itself" (*Enc.* §252/MM 9: 37).

Physics is thus concerned with the essentialist, reflective prioritization of the relationship between a prioritized, universality-based, immaterial form and particular, material matter. Where mechanics assume material bodies' difference and posit unified form as something added "ad hoc" and "sought after," physics discusses how physical form always already relates to, defines, and guides matter and its individual bodies. Physics thus conceptually begins with a formal unity that functions as a condition for the difference of mechanics' individual bodies and thus defines individual bodies through differences in universal form. Where mechanics simply assumes the individual, material bodies' difference, physics justifies it with reference to form:

> [According to physics, matter] has individuality insofar as it has the being-for-itself within itself in such a manner that being-for-itself is developed within matter and thus determines matter in itself. Matter thus emancipates itself from heaviness, manifests itself, determining itself in itself and determines the spatial out of itself through its own immanent form in contrast to heaviness, which was previously only being determined as something other to matter, as a center that was sought by matter. (*Enc.* §272/*ENZ* 109)

Physics thus describes nature in terms of a form that has emancipated itself from mechanics' priority of the bodies of individualized matter (*Enc.* §272/*ENZ* 231). Matter accordingly follows form: Physical bodies are what they are and behave in the way they do because they are defined and guided by a body-specific form (that nevertheless differs from the bodies) (*Enc.* §252/*ENZ* 37). Physics' form is thus something concrete that equips individual bodies with a particularity they lacked in mechanics.

Parallel to the beginning of Hegel's discussion of the *Logic*'s "logical essence" with "shine," "identity," "difference," and "contradiction" as forms of pure relationality (*WL SL* 341), physics begins with the self-identity of immaterial form for which bodies are indifferent and which determines matter's individuality in an immediate manner.

The first of these are what Hegel labels the categories of a "physics of universal individuality" (*Enc.* §274/*ENZ* 231), where form is initially purely abstract and slowly increases its materiality. This produces the categories of "light" as formal self-identity, the formal differentiation of "darkness," the form-matter duality of "rigidity," and the form–body contradictions that are "the bodies of moons and comets" (*Enc.* §279/*ENZ* 236). Physical form also immediately structures individual bodies according to the categories of the "elements" air, fire, water, and earth and in the "elemental and meteorological process" (*Enc.* §281ff./*ENZ* 237ff.).

The more concrete "physics of particular individuality" then describe how physical form defines the particularity of individual, material bodies and their interaction with each other and with their environment. This gives rise to the categories of "specific heaviness," "adhesion," "pointedness," "brittleness," "linearity," "rigidity," "tenacity," "elasticity," "cohesion," "sound," and "warmth" (*Enc.* §292ff./*ENZ* 243ff.) until finally, the physics of *total individuality* describe nature as a self-referential form within which material bodies are utterly defined and guided by form's processes (*Enc.* §272ff./*ENZ* 231ff.).

Physics' qualified differentiation of matter's individuality by form thus ultimately leads into form's complete determination of matter. This establishes form as the totality that defines matter as well as the finite processes that guide finite, material bodies (*Enc.* §307/*ENZ* 253): Physical bodies and their procedural interactions are now how form makes and guides them. This domination of matter by form also shapes the most concrete physical categories of "magnetism," "electricity," and finally "chemical physics" (*Enc.* §309/*ENZ* 198ff.).

### *2.1.5 Hegel's Rejection of Physicalism*

However, even in chemical physics (or "chemism"), the totality of assumed, form-defined, and form-guided physical bodies and processes fundamentally differ from the form that determines and differentiates them. Chemism is accordingly marked by the contradiction between an overarching, form-based identity of differing bodies and the bodies' difference (*Enc.* §326/*ENZ* 287): According to the form, the bodies are one,

according to their bodily differences, they are many. This enables chemism's form-defined processes in which differentiated, material bodies are identified while identified bodies are differentiated (*Enc.* §326/*ENZ* 288).

Chemism thus assumes an overarching form that separates and unites individual bodies so that the bodies' unity as well as their differences are a function of this form: The bodies are and behave in the way that the form determines. Still, even here, the bodies remain finite individuals that differ from the form and from each other by assumption. The form-based chemical process is thus also something "external" that happens to inherently chemical bodies. This renders such bodies to be either presuppositions by the form-based chemical process or results of it (*Enc.* §329/*ENZ* 272ff.).

Furthermore, Hegel argues that the individual sequences of the chemical processes differ from each other and thus define particular, finite processes that presuppose each other and therefore have a beginning and an end. They thus fail to automatically lead into one another, which prevents the kind of "infinite," self-referential process that is required for explaining an integrated unity of form and bodies (*Enc.* §329/*ENZ* 272ff.). The bodies of the chemical processes thus remain immediate individuals throughout: While their analyses result in mutually indifferent products, even heat-based and other unificatory chemical processes disappear in the neutral product of the process where bodies and processes remain differentiated (*Enc.* §335/*ENZ* 283).

Crucially, chemical physics thus still fails to explain *why* form-defined bodies and the form-based processes that guide them are able to interact in the first place: If, by assumption, the formal process is immaterial and the differing bodies are material, why is the form that defines the chemical process able to affect and determine the bodies at all? While the formally particularized bodies of chemism are determined through a shared form-based process, they remain differentiated from it and from each other.

Whether physics discusses (1) form in absence of bodies, (2) form-defined, particular bodies, or (3) bodies as functions of a formal process, it consistently assumes the difference between the form's immateriality and the bodies' particularized, material nature and thereby prevents a fundamental explanation of their compatibility and even chemism, as the most concrete category of essentialist nature's physics, fails to overcome physics' divisive assumptions:

> The chemical process is affected by separation because of the immediacy of the bodies that enter the process. Its moments thus appear to be external conditions, whatever separates itself in the process turns into mutually indifferent products, the fire and the inspiration extinguish in neutrality

> and do not reignite themselves again; the beginning and the end of the chemical process differ from each other; – this defines the process' finitude, which prevents it from participating in life and which differentiates it from it. (*Enc.* §335/*ENZ* 333)

Hegel thus argues via a *reductio ad absurdum* that chemism falls victim to a fundamental self-contradiction when it assumes difference. This motivates him to reject physics' claim to being the final and thus absolute description of the conceptual truth about nature and reality in general. He thus rejects a reductionist physicalism that claims to explain all of reality in terms of physics either by suggesting that physical reality is the purpose of the logical idea's metaphysical reality and of nature's mechanics or by arguing that all seemingly nonphysical facts and events can be explained in terms of physics. Since physics constitutes nature's "essentialist" moment, Hegel's *reductio* of physics entails that he rejects the label of "essentialist naturalism" and of "physicalism" for his philosophy as a whole.

### *2.1.6 Hegel's Rejection of General Naturalism*

Still, one may wonder if Hegel is still a "naturalist" in the sense that he accepts the idea of nature in its categorial entirety as the most adequate description of reality. His suggestion that chemism and thus physics is not the highest determination of nature leaves it open whether nature's most concrete determination, "organics" (*Enc.* §337/*ENZ* 337), is able to avoid self-contradiction.

Hegel thus argues that the inability of physics' chemical process to account for the interaction of the processes and bodies is remedied by organics' integration of these within a self-referential, internally differentiated, and embodied organic process:

> The mutually indifferent bodies are thus defined as a mere moment of individuality [. . .] ; it is the concrete unity with itself that creates itself at once out of the particularization of the differentiated bodies. It is the activity of negating this one-sided form of relation to itself, to separate itself into the moments of the concept and to particularize itself and at the same time, to guide itself back into this unity. This is the infinite, self-igniting and maintaining process, the organism. (*Enc.* §336/MM 9: 334)

Within the organism, all form-defined processes as well as all form-shaped, individual bodies are thus united in a self-perpetuating unity (*Enc.* §252/MM 9: 37). Each moment is cause and effect, and each sustains and

depends on every other moment through the shared, bodies-coordinating and -animating form. This enables organics to explain the bodies' and form's compatibility: The organic bodies and the form-based organic process are a unity from the beginning; the form renders the bodies what they are and the bodies enable the self-referential, formal process. Bodies and form support and orientate each other, the bodies *are* the formal process and vice versa. The bodies are compatible because their identity integrates their difference and their individuality is a function of the overarching form: The individual aspects of the organic body are shaped by the process; it is their coordinating principle. Bodies are how they are and they function in the way they do because the form is their organizing, procedural principle. Meanwhile, the formal process of life is only possible because of the bodies and their contributions. Organics' fundamental unification of the form's universality and the bodies' particularity enables it to explain the particulars as aspects of the universal's self-reference.

As the final, most concrete dimension of nature, Hegel's organics thus describe how the form and the bodies' individuality are integrated in an "immediate" manner (*Enc.* §337ff./MM 9: 284ff.): They are one *and* they can be differentiated at all because they are *always already* united. This notion informs the categories of "plant life" (*Enc.* §343/MM 9: 371) and finally of "animal life" (*Enc.* §350/MM 9: 430), which includes "illness" (*Enc.* §371/MM 9: 520) and "the death of the individual animal" (*Enc.* §375/MM 9: 535). All of these undermine physics' claim to being the most concrete description and purpose of natural reality because they manage to explain the compatibility of form and bodies out of a prioritized yet internally differentiated unity that escapes physics' assumption of the difference between form and bodies. This "deduction" of organics amounts to Hegel's proof of how and why physicalism self-contradicts and why the label "physicalist" is inadequate for describing his philosophy. Mechanics' and physics' self-undermining assumption of a difference between bodies and form is thus overcome in the unity-based notion of organics.

### *2.1.7 Hegel's Critique of Organics and Broad Naturalism: From Nature to* Geist

Does this entail that Hegel is a "naturalist" in the sense that organics as nature's highest categorial form are deemed to be the most adequate description of reality? A case can be made to the contrary. In the Philosophy of Nature, Hegel argues by way of yet another *reductio* that even organics' and thus nature's most concrete category, the "death of the

individual out of itself" (*Enc.* §375/MM 9: 309), suffers from a difference-related self-contradiction. By describing what he perceives to be the immanent contradiction in the categories of "individual animal life and death," Hegel thus sets out to refute the notion that nature could be the most concrete category of reality.

Following his deductions and critiques of the categories of "the nonliving organism," "plant life," and "animal life," Hegel argues that the category of "the living individual animal" (*Enc.* §375/MM 9: 309) represents organics' and thus nature's most advanced category that describes the purpose of mechanical and physical reality: These exist so that natural life can exist. However, organics' "living (animal) individual" is confronted by an internal, negative force that first leads to its "illness" and then to its eventual "death" (*Enc.* §375/MM 9: 309). In both cases, this negation of natural life has its roots in the assumed difference between the universality of the living individual's genus on the one hand and the living individual's particularity (*Enc.* §376/*ENZ* 309) on the other: The particular individual fails to live up to the immanent, universal standard of its natural genus. The category of "the animal's death" proves that in all of nature, universality, and particularity remain fundamentally unreconciled: Death's universality-based negativity contradicts the particularity of life entailing that the ultimate purpose of natural life is death. To Hegel, this renders naturalism a "philosophy of death" because despite organisms' birth, sustenance, growth, and procreation, they must eventually, and finally, die.

However, this notion of death also raises the question why the genus' negativity is able to destroy the individual at all. If the genus' universality differs from the individual's particularity to the degree that they fundamentally contradict each other, why are they able to interact in the first place? According to Hegel, death's annihilating effect on natural life implies that the two must be identical from the start: The genus' universality is able to destroy life's particularity because from the beginning, they are aspects of the same unity.

This realization gives rise to the notion that particular individuality must be an aspect of the negativity of the genus' self-referring universality (*Enc.* §375ff./*ENZ* 309). In negating the individual's particularity, the genus' universality truly negates *itself*, albeit in particular form. What seems to be an external negation of particularity is thus truly a *self*-negation by universality. Death's contradiction between the particular individual's life and the genus' universality turns out to be an internal dynamic of a particularity-accommodating universality's overarching self-reference (*Enc.* §376/*ENZ* 309).

### *2.1.8 The Emergence of* Geist *out of Nature*

According to Hegel, this categorial shift away from nature and death undermines nature's absolute status and rejects the notion that "death" constitutes the final purpose of reality. It gives rise to the category of "*Geist*" (*Enc.* §376/*ENZ* 309). *Geist's* all-encompassing unity identifies (1) the genus' seemingly individuality-external, universality-based negativity and (2) the individual's particular positivity. It renders them aspects of an explicitly self-referring category: *Geist* is both genus *and* particular individual so that within *Geist*, individuality becomes an aspect of the genus' self-reference. Now, all exists and happens within *Geist*, everything forms part of *Geist's* concrete universality (*Enc.* §376/*ENZ* 309). This includes the *Logic*'s metaphysical categories, mechanical and physical facts and events, and natural life, pain, sickness, and death (*Enc.* §382/*Enc.* 3I: 15). These have become features of *Geist*'s negativity-driven, particularity- and individuality-accommodating self-reference so that all positivity and all negation is an articulation of *Geist*.[5]

Since all is within *Geist*, there is nothing to contradict *Geist*: All negation is a self-negation undertaken by *Geist*'s self-referential, dynamic "eternity" (*Enc.* §382/*Enc.* 3I: 15). In contrast to nature, *Geist's* particularity is now "adequate" to its genus because the two are aspects of the same metaphysical principle. Consequently, nothing can harm or kill the particular, *geistige* individuals that constitute the "appearance of *Geist*" apart from *Geist's* own universality (*Enc.* §382/*Enc.* 3I: 15). However, such annihilation of individual *geistige* beings is not a "suicide" by *Geist* as this would imply an unreconciled inadequacy to obtain between them as *Geist's* particular manifestations and *Geist's* universality. This is impossible since from the beginning, *Geist's* universal and its particulars are explicitly integrated and thus "live up to each other's standards." Since *geistige* beings are universal *Geist* as much as universal *Geist* is particular *geistige* beings, the creation and destruction of *Geist's* particulars by *Geist's* universality is *Geist's* life rather than its death.

[5] The self-positing structure of *Geist* entails that in contrast to animals, the natural drives of *geistige* agents are always informed by the active indeterminacy of the will that enables the agent to choose to negate, assert, form and direct the drives in any way she or he sees fit (cf. $PR_H$ 28ff.). This Kant-inherited notion of active and spontaneous indeterminacy is unavailable to (neo-)Aristotelian essentialist naturalism. This also entails that our drive-related, moral, and ethical orientation does not unconsciously grow like a tree grows from a germ to its final form ($PR_H$ 96) but is actively formed through the "supernatural" power of our *geistige* will's indeterminacy ($PR_H$ 28).

This overarching self-referentiality of *Geist* implies that *Geist* has already overcome any possible obstacle, that it has recovered from any complication and has negated any negation: Since all negation is internal to *Geist*, it is in its service *from the beginning*. Meanwhile, "we" are *Geist*'s consciousness-equipped appearance and from "our" perspective, we confront an objective, obstacle-ridden reality, live, suffer hardship, get ill, and die. To us, *Geist appears* to be limited as much as we are insofar as we think of it in terms of our consciousness. In truth, however, our suffering and death is a *Geist*-internal event, expressive of *Geist*'s self-development and -negation. It is not *Geist* that is negated in the individual suffering and death but *Geist lives* in and through the life and death of its particular individuals (*Enc.* §381/*Enc.* 3I: 9ff.). Individuals live, suffer, and die within *Geist*'s "eternal" (*Enc.* §384Z/*Enc.* 3I: 20) and thus self-referential life. In contrast to nature, Hegel argues, *Geist's* overarching and self-referential unity is explicit from the beginning so nature's and thus naturalism's "philosophy of death" is replaced by a *Geist*-based philosophy of explicitly anti-naturalistic, "eternal life" (*Enc.* §577/MM 10: 395).

### *2.1.9* Geist *and the Sublation of Nature*

Crucially, nature's categorial sublation within *Geist* reveals *Geist* to be the true ground of nature. This entails that nature's time, space, mechanics, physics, life, and death exist as mind-related aspects of *Geist* (*Enc.* §384/*Enc.* 3I:18).[6] While the Philosophy of Nature describes nature as independent reality, the Philosophy of Spirit (*Geist*) describes "nature" – with the human body and man-made objective reality – as part of *Geist's* objective dimension. Nature as such thus becomes a dimension of *Geist* and is thus "*nature* in, for and as *Geist*."

At the level of *Geist*, all that seems to be "natural," like parts of the mind-external world, the mind-related body, the mind-internal psychological drives, etc., are thus truly *Geist* that presents itself "as if it were not itself" (*Enc.* §384/*Enc.* 3I:18). What seems to be nature to "us" truly *is Geist* in objective form(s). Tautologically, from *Geist's* conceptual perspective barring philosophy, *Geist* is all there is and all metaphysical and natural realities are an aspect of it.[7]

[6] For a constructivist reading of nonnatural *Geist* cf. Pippin 2002.

[7] If there were anything else but *Geist* at *Geist's* ontological level, for example non-*geistige* nature, *Geist* would be incompatible with and *geistige* beings could not cognize or interact with it.

To Hegel, *Geist* is thus the ontologically "first" (*Enc.* §381/*Enc.* 3I:9) foundation and "ground" of the objective and subjective, mind-related world: The objective world that finite, *geistige* beings confront can only be explained as the objective aspect of *Geist* and thus as related to *Geist*'s subjective dimension "mind." It is thus nature's status *as sublated in Geist* and thus *as an aspect of Geist* that enables the explanation of nature's compatibility with *Geist*'s "soul," "consciousness," and "mind": The seemingly natural, objective dimension of *Geist* successfully relates to these because these *are Geist*.[8]

## 2.2 Hegel vs. Essentialism

### *2.2.1 Hegel and Naturalist Essentialism*

Hegel thus not only rejects the essentialist naturalist position of physicalism but also defies a broader naturalism when he rejects the most concrete category of nature in favor of *Geist*. And yet, this leaves open the possibility that he might still be a "naturalist essentialist" who argues in favor of truly objective essences of entities and events that are in some sense mind- and thus subjectivity-independent.

As recent interpreters have pointed out, Hegel's remarks about "real" concepts that define the world instead of just existing in and through the mind's subjectivity allow for this question: Are Hegel's concepts "real" in the sense that they play a role similar to the one that essences and claims about the "nature" of entities and events played in the substance-metaphysics of Plato, Aristotle, and some rationalists? Put in their terms, is Hegel a naturalist essentialist?

### *2.2.2 Hegel's Critique of Metaphysical Essentialism*

Parts of an answer might be found in Hegel's critique of essentialist metaphysics and in the structure of his notion of *Geist*. In his *Logic*, Hegel argues that by the ever implicit and thus inevitable standard of "the Concept," all notions of truth that rely on any form of essentialist

[8] Hegel argues that this does not entail the subjective idealist thesis that denies the reality of "nature as such": From the system's overarching perspective, the "objective" (*Enc.* §577 *Enc.* 3I:276) ontological domain of "nature as such" determines *Geist* negatively as "subjective" domain. At the same time, the domain of *Geist* determines nature so that each can only be comprehended in negative delineation from the other. Nature as objective idea is "not *Geist*," that is the "subjective idea," *while Geist* is "not nature" that is the "objective idea" (*Enc.* §577 *Enc.* 3I:276).

metaphysics eventually self-contradict. Each contradiction leads to its replacement by ever more concrete, still essentialist categories until the most elaborate essentialist account of truth in the form of "reciprocity" (*WL SL* 503) self-contradicts and is sublated into the notion of "the concept" (*WL SL* 508). What does essentialism get wrong?

Hegel identifies essentialism's commitment to relationality and "mediation" as the fundamental source of the essentialist categories' self-contradictions (*WL SL* 326). They assume a difference between the "essential" and the "unessential" and even the most concrete categories of essence maintain that truth consists of two elements that relate to, determine, and mediate each other while one of them is prioritized over the other (*WL SL* 339). This renders the categories of the *Logic of Essence* unable to explain each category's moments' determination with reference to its reflective counterpart: Like the "essential" is not the "inessential" so the "thing" is not its "properties," "substance" is not its "accidents," "existence" is not its "ground," etc. (*Enc.* §125/*Enc.* 1BD:192; *Enc.* §131/*Enc.* 1BD:197; *Enc.* §150/*Enc.* 1BD:223).

The logic of essence thus assumes determinacy through mediation and relationality. Initially, the categories of essence consist in the forms of seemingly relata-free relationality called "identity," "difference," "contradiction," and "ground" (*Enc.* §115ff./*Enc.* 1BD:177ff.), while the more concrete categories explicate the mutual determining and mediation of two relata. This enables the notion that no moment is simply assumed or presupposed: There is a reason for each moment's existence and determination that inheres in its relationship to its counterpart so that each moment is mediated and justified with reference to its other. While this blocks the charge that one simply assumes an immediate, self-identical notion of truth, it enables another: as was the case with physics' framing of form and bodies, assuming the logical moments' difference renders inexplicable how and why the moments are compatible in the first place. Since their difference is posited as fundamental, their compatibility becomes inexplicable.

Still, what makes the categories of essence appealing is their ability to convey a sense of "realism": They suggest that there is a prioritized, objective, and thus "real" universal truth, order, harmony, nature, substance, etc. on which the subordinated, inessential particulars such as modi, accidents, and properties depend (*Enc.* §150ff./*Enc.* 1BD:223ff.). At the same time, the subordinated particular elements are not mere, reducible illusions because they aid in determining the prioritized universal. Nevertheless, the prioritized, universal truth is privileged over the subordinated particular and thus retains a sense of "realist" priority and objectivity in the face of the subordinated moment's "subjectivity."

And yet, Hegel maintains that the essentialist difference between universal and particulars is itself instable: While the moments' difference is assumed and thus enables their mutual mediation, it is not intelligible *why* the differentiated entities are able to relate to each other in the first place. Unless the universal and particular elements are explicable in terms of a singular unity that explains how the differentiated elements mutually constitute and hang together without undermining their specific determination (*Enc.* §158/*Enc.* 1BD:230), their compatibility remains inexplicable.

However, in one sense the logic of essence achieves such unity because in order to ensure the compatibility of its moments, the prioritized, identity-representing universal moment is posited as absolute: For example, the universality of "the thing" precedes the particular "properties," the "ground" precedes "existence," and "substance" precedes the "modi" and "accidents" (*WL SL* 386–506). And yet, this reduces the subordinated moment to being a variation of the prioritized moment: For example, the accident *is* substance, the appearance *is* the ground, albeit in a particular form. This undermines the subordinated moment and deprives the prioritized moment of a means for its own determination by mediation (*WL SL* 387). Without a particular to contrast itself with, the prioritized universal is underdetermined.

Since the *Logic of Essence* prioritizes the difference of the moments over their identity, it cannot justify this difference with reference to their identity (*Enc.* §158/*Enc.* 1BD:230). The moments are merely implied to be compatible and thus identical in some sense, which contradicts their explicitly assumed difference (*Enc.* §112/*Enc.* 1BD:173). Since the logic of essence's argumentative push for the explication of the moments' reflective identity comes logically *after* the assumption of their difference, difference and identity remain in conflict: Either the moments differ and mutually mediate or they are identical and are therefore able to relate to each other. Forced to choose between the moments' identity and their difference, their identity is prioritized, which in turn undermines their initially assumed difference and mutual determination.

For example, given the priority of the universal moment, the particular "properties" *are* the universal "thing," particular "existence" *is* the universal "ground," particular "accidents" *are* the universal "substance," etc. The subordinated, inessential, and particular moment is explained away with reference to the prioritized, essential, and universal moment: Ultimately, all there is is the "thing," the "ground," the "substance," etc.

To Hegel, the privileging of the universal thus entails its undermining: If fundamentally, metaphysical truth is the universal principle, it is not

intelligible what this is determined as because on its own level, it cannot be contrasted with its particular manifestation. If every inessential particular truly is the essential universal, all is the universal. So on its own ontological level, the universal cannot be "non-particularity" and is, therefore, underdetermined. According to Hegel, essentialist logic thus (1) assumes its moments' difference, thereby (2) provokes the need to unify the moments, and thereby (3) leads into the undermining of the moment that is prioritized in the attempt to unify the moments (*Enc.* §112/*Enc.* 1BD:173ff.). The objective "reality" of essentialist metaphysics comes at the price of irreconcilable self-contradiction.

Given this logical instability of the categories of essence and thus the metaphysics of essentialism, Hegel rejects essentialism's strategy of attempting to guarantee a "realist" sense of the objective, prioritized universality by assuming the difference between it and its subordinated, inessential, and particular counterpart. Hegel sets out to improve on this conceptual instability with his "Logic of the Concept" (*WL SL* 507ff.), that is with his concept-metaphysics, where universality and particularity are simultaneous rather than hierarchically ordered. To Hegel, the objective and real validity of concepts is not grounded in their forming part of an essentialist (e.g., substance-based) cosmic order. Instead, they are real because they are variations of the reality-defining concept that avoids essentialist self-contradiction with its universality- and particularity-balancing unity that he calls "individuality" (*Enc.* §163/*Enc.* 1BD:236). The label "naturalist essentialism" accordingly misrepresents Hegel's concept-metaphysical anti-essentialism.

### 2.2.3 *Hegel's Critique of Essentialism in the Philosophy of Mind*

A similar criticism applies to neo-Aristotelian readings of Hegel in the context of what he describes in his philosophy of *Geist*: Unlike some naturalist and realist[9] interpreters of Hegel can be taken to imply, Hegel's finite and particular, *geistige* subjects do not confront a prioritized, substance-metaphysics-based, "real" and objective order, or an assumed or given substance-based objective order of value.

Instead, the objectivity encountered by Hegel's finite subjects is a conceptual moment of the same concept-structured *Geist* that simultaneously grounds the mind's irreducible subjectivity (*Enc.* §382/*Enc.*

[9] The term is used here not in the technical sense that Hegel assigns to it in the *Science of Logic* but rather in the sense of a nonideal, objective objectivity or world order.

3I:15ff.). Hegel's notion of *Geist* thus balances the mind's subjectivity and the world's objectivity without privileging or reducing either: *While* we as soul-, consciousness-, and mind-possessing finite subjects define and confront a presupposed, irreducible objectivity, this objectivity is determined by the irreducible subjectivity of our minds (*Enc.* §387/*Enc.* 3I:25) Without our minds' subjectivity, there are no objective worlds or bodies. *At the same time*, our minds' subjectivity implies a relation to an objective world and order. According to Hegel, this concept-based notion of the *Geist*-based, mutual constitution of objectivity and subjective mind escapes essentialist and realist accounts as these presuppose a real, objective world and its order to *then* explain the mind's subjectivity in terms of that order.

In contrast to the notion of *Geist*, Hegel argues, essentialist accounts of the mind thus undermine the mind's indeterminacy-based subjectivity: The mind becomes an aspect of the objectivity of the cosmic, essentialist, and naturalist order. Ultimately, and despite all assertions to the contrary, all reality, including the mind, is thus objective. And since there exist no ontologically independent, undetermined subjects in an essentialist framework, there cannot be individual self-determination or freedom. Whatever happens, takes place within and because of the objective order and its principles (*Enc.* §482/*Enc.* 3I:215). This entails that our subjectivity is "real" because it is an aspect of the real, presupposed objectivity (nature/substance) and our minds are capable of cognition and action because they, too, form part of it. As was the case with general essentialist metaphysics, this explains the compatibility of our particular minds with our bodies and with the world: All of these are based on the same objective order. However, this comes at the price of a reduction of our subjectivity to the objective order: "We" are compatible with and have access to our bodies and the ordered world because we *are* aspects of the same objective order. Everything that fundamentally exists, including us, *is* the objective order.

This not only undermines the irreducible subjectivity of our minds but also affects our status as particulars: If, ultimately, substance's objective universality is all there is, then particular, mind-equipped beings are not real. Our subjectivity is reduced away, depriving the objective world and its order of a means of logical mediation.

To avoid this, Hegel bases his account of *Geist* on the metaphysics of "the Concept," according to which the world's objectivity and the world-confronting, subjective mind mutually mediate and are as irreducible as the metaphysical Concept's moments of universality and of particularity within the Concept's individuality (*Enc.* §163/*Enc.* 1BD:236). The

subjectivity of mind and of the objective world are logically simultaneous: Neither moment is prioritized in a manner that undermines or reduces the status of the other. Each moment limits and negatively determines the other as each is each the other's negation (*Enc.* §387/*Enc.* 3I:25). The moments' difference is thus justified with reference to their unity and vice versa. Where the metaphysics of essence assumes difference and could only establish identity and thus compatibility at the expense of difference, the logic of the Concept mediates and protects both the moments' identity and difference *at once* (*Enc.* §160/*Enc.* 1BD:233; cf. Wretzel 2021).

Hegel's *Geist*-related concepts are thus "objectively real" as aspects of *Geist*'s objective dimension and they are "subjectively real" as aspects of *Geist*'s subjective dimension, that is of the same principle that also appears in form of our minds. But they can only be so because they are always already conceptually grounded in concept-based *Geist*. In contrast to "realist" accounts, Hegel's thus implies a *Geist*-internal relationship between an irreducibly objective reality and an irreducibly subjective mind.

Apart from physicalism and naturalism, Hegel thus also rejects the "metaphysical naturalism" of pre-Kantian essentialism and of its reductionist metaphysics of mind and world. What, then, is Hegel's constructive alternative to these conceptual competitors?

## 2.3 Hegel's Own Concept-Idealism

### *2.3.1* Geist *and Nature as Moments of the Idea*

On a linear reading of Hegel's truly circular system, it might seem that he argues that *Geist* is all there is and that the logical idea and nature are but sublated aspects of *Geist*. Do the metaphysical order of the logical idea and the natural-metaphysical order of the idea as nature only exist "for, through, and in *Geist*"?

Hegel seems to reject this notion when he argues that the sublation of nature's externality in *Geist*'s self-reference does not entail that nature as such loses its status as *Geist*-independent reality (*Enc.* §577/*Enc.* 3I:276). *From the perspective of Geist*, nature is always "for *Geist*" and thus an aspect of *Geist*. In this sense, Hegel agrees with the consciousness-based idealisms of Kant and Fichte: Unless nature would not always already be an aspect of *Geist*, nature would not be compatible with, accessible to, and shapeable by *geistige* subjects (*Enc.* §575ff./*Enc.* 3I:276). However, Hegel further argues that given the primacy of *Geist*, the logical idea and nature would only exist because there is *Geist*. This would render the logical idea

"abstract *Geist*" and nature "unconscious *Geist*," making Hegel a spiritualist or "*Geistphilosoph*" rather than an idealist.

And yet, if this were the case, the same contrasting issue that haunted essentialism would reoccur at the system's level: If *Geist* were all there was, it would have nothing to be contrasted with and it would be determined and mediated by on its own ontological level (*Enc*. §577/*Enc*. 3I:276). This would render *Geist* underdetermined and incomprehensible.

To avoid this, Hegel's system describes the logical idea, the idea as nature, and the idea as *Geist* as aspects of a "conceptual" relationship in which the logical idea functions like the metaphysical concept's universality, nature like particularity, and *Geist*-like individuality (*Enc*. §18/*Enc*. 1BD:46). This enables him to argue that the logical idea and nature are not only for *Geist* but are also real in the same sense in which *Geist* is real. The logical idea thus exists "as such" and "for *Geist*." Nature exists "as such" and "for *Geist*" as the logical idea, nature, and *Geist* mediate and define each other within a conceptual unity.

At the most general level of the system, Hegel's systematic account of the relationship between logical idea, *Geist*, and nature may thus be read as an attempt to defend the reality of the logical idea and of nature in the face of *Geist* while enabling the mediation and determination of *Geist*: The subjective idea "*Geist*" is defined as "non-objective" and "non-abstract" while the objective idea "nature" is "non-subjective" and "non-abstract." Meanwhile, the abstract, logical idea is "non-objective" and "non-subjective." At the same time, Hegel wants to guarantee that despite these differences, *Geist* is still compatible with the logical idea and nature as they are part of the same unity.

Hegel's idealism thus fundamentally rests on the notion of the conceptual and therefore speculative unity of logical idea, *Geist*, and nature. Nature as such and nature-sublating *Geist* are defined as irreducible, differentiated, and independently "real" forms of the idea (*Enc*. D, §18/*Enc*. 1BD: 46) so that all three forms are immediate and determined variations of the same idea that mediate and determine each other. Meanwhile, all three are determinate, differentiated, and still compatible and knowable (*Enc*. §577/*Enc*. 3I:276).

The logical idea and nature thus retain their realist properties despite their unity with and within *Geist*. The same idea and nature that are sublated within *Geist* are also as irreducibly "real" as *Geist* because from the overarching, systematic perspective, idea- and nature-sublating *Geist* remains determined in contrast to the logical idea and to nature (*Enc*. §577/*Enc*. 3I:276).

This enables the claim notion that the idea and nature exist within *Geist and* "in their own right": They cannot be reduced to *Geist* since *Geist* is only what it is in contrast to the logical idea and to nature. Even the idea- and nature-sublating *Geist* needs the contrast to the logical idea and to nature to be what it is. The contrast between the logical idea, nature, and idea- and nature-sublating *Geist* as well as the identity-based sublation of idea and nature in *Geist* are possible because both nature and *Geist* are forms of the idea: Nature and *Geist* are differentiated and compatible and can therefore be contrasted, compared, and identified because they share the common ontological status of being forms of the Idea (*Enc.* §577/*Enc.* 3I:276).

With regard to the label "naturalism" as a description of Hegel's idealism, this entails that since nature is only defined in contrast to *Geist*, there is no sense in which one could argue that for Hegel, nature is independent from *Geist*. At the most basic ontological level, nature is only what it is in contrast to the logical idea and to *Geist*, just like *Geist* is only what it is in contrast to the idea and to nature. Just as nature is irreducible to *Geist*, *Geist* is irreducible to nature, while both are forms of the idea. Naturalism can thus be rejected both from the perspective of nature-sublating *Geist* and from the overarching perspective of the idea-based system: To *Geist*, nature is *Geist*, while to the system, *Geist* and nature are mutually mediating, equally footed forms of the idea (*Enc.* §577/*Enc.* 3I:276). The ultimate ontological principle of Hegel's system is thus the idea and not nature or *Geist*. And since Hegel's rejections of physicalism, of narrowly conceived naturalism, and of metaphysical essentialism's wide naturalism are based on the metaphysics of the concept-based idea, he is best described as an idealist rather than as a naturalist or essentialist.

## 2.4 Conclusion

Hegel rejects "essentialist naturalism" – and thus physicalism – on the grounds that physics is not able to explain the very compatibility between form and material individual bodies that it presupposes. At the same time, he defies a mechanics-, physics-, and organics-based naturalism by arguing that nature is sublated into *Geist*. This undermines naturalism's claim that nature constitutes the most fundamental principle of reality. Meanwhile, Hegel rejects metaphysical essentialism on the grounds that it fails to achieve a conceptual stability between universality and particularity and inadvertently undermines the privileged universality. While Hegel's

absolute idealism acknowledges a notion of "nature as such," nature still relies on mediation by *Geist* and is grounded in the ontological Idea. This undermines any notion of "naturalism" according to which the idea or *Geist* can be reduced to nature or have nature as their purpose and suggests that Hegel's circular system rests on the Idea as nature and *Geist*-generating notion of truth.[10]

[10] I would like to express my deeply felt gratitude to Christopher Yeomans and Joshua Wretzel for commenting on an earlier draft of this chapter.

CHAPTER 3

# Naturphilosophie *and the Problem of Clean Hands*
## *Hegel and Alexander von Humboldt on Nature*

*Elizabeth Millán Brusslan*

The late 1700s and early 1800s were years of intense and innovative intellectual development in German-speaking lands; the arts flourished and aesthetics developed as a serious branch of philosophy. Philosophers, scientists, and artists collaborated without the borders to which we have become all too accustomed. Part of this collaborative spirit arose out of necessity, as certain fields had not yet defined their borders. As John Reddick points out, "[w]e need to appreciate the real enormity of the problems faced by life-scientists in the half-century or so before Darwin did for biology what Newton had done for physics almost two centuries earlier; even the very word 'scientist' – not coined until 1834 (by William Whewell) – is an anachronism that tends to beg essential questions" (Reddick 1990, 330). The two thinkers I discuss in what follows were each dedicated to the life sciences by way of the study of nature but addressed this study in markedly different ways. Alexander von Humboldt (1769–1859) and Hegel each carved out space for two distinct approaches to "science": one more empirical and the other largely speculative. Humboldt, working and writing before the "magnificent vantage point that Darwin" (Reddick 1990, 330) was to construct, did not have an established scheme into which to place his contributions to our understanding of the natural world. Nonetheless, Humboldt's careful measurements had a powerful impact on our understanding of that world. Given that Humboldt's investigation of nature took him on a voyage to the Americas (1799–1804), he also faced the problem of presenting a radical new landscape to his European readers. Charting uncharted territory became Humboldt's specialty, and it resulted in approaches to his subject matter and the development of literary forms that were (and remain) difficult to characterize. Humboldt dealt with the problem of science's disarray by carving out new spaces for his areas of inquiry. Hegel, too, especially the Hegel of the 1801 *Differenzschfrift*, was focused on the problem of nature's fate at the hands of philosophers, and he too

attempted to carve out new areas of inquiry that blended the natural sciences with aesthetics. The relation between the natural sciences and philosophy in Hegel's thought remains a source of controversy among scholars.[1]

How should we categorize the blend of empirical and aesthetic methods that was a hallmark of philosophical investigations of nature during this period of thought? Was it *Naturphilosophie* or rather *Naturforschung*? Do these terms point to a meaningful difference? Or are we dealing with distinctions without difference? Clarifying Hegel's and Humboldt's relation to these areas of investigation of nature will help us to assess their contribution to the intellectual developments at the turn of the nineteenth century, and it will also help us to mark important distinctions between their approaches to nature. In choosing to focus upon the work of Hegel and Humboldt and their contributions to our understanding of nature, while leaving another prominent *Naturphilosoph* of the period, Friedrich Schelling, in the background, I hope to bring attention to overlooked connections between Humboldt and Hegel, connections which uncover important aspects of the understanding of nature, in general, and the landscape of Latin America, in particular, during the period. I begin with a brief historical overview so that we have some sense of the main themes that fueled the development of *Naturphilosophie*.

## 3.1 Natural Beauty in the Age of Goethe and Schiller

In their lifetimes, Goethe and Schiller shaped the culture of German-speaking lands, not only through their writings on nature and art and their prolific literary work but also in their role as editors of journals that helped to set the intellectual tone of the period. Schiller's journal, *Die Horen* (1795–97), and Goethe's *Propyläen* (1798–1800), though short-lived, were important literary vehicles of the period and provided forums that brought scientists, historians, philosophers, and poets into conversation with one another. According to Ilse Jahn and Fritz Lange, editors of the *Jugendbriefe Alexander von Humboldt* 1787–95, in the letter that Schiller sent to Humboldt inviting him to contribute to *Die Horen*, Humboldt was told that the journal would deal with everything that can be treated "with taste and philosophical spirit." Schiller mentions philosophical investigations and historical and poetic presentations of topics for the journal: Natural scientific investigations were not explicitly mentioned. Yet, in

[1] For an excellent treatment of these issues, see Houlgate 1998, xi–xxvii.

his lone contribution to *Die Horen*, Humboldt delivered a piece that brought science and literary fancy together. As Humboldt tells us in the preface to the second edition of *Ansichten der Natur*:

> The second edition of the *Views of Nature,* was published by me in Paris in 1826. Two papers were then added, one, "An inquiry into the structure and mode of action of Volcanos in different regions of the earth"; the other, "Vital Force, or The Rhodian Genius." Schiller, in remembrance of his youthful medial studies, loved to converse with me, during my long stay at Jena, on physiological subjects. The inquiries in which I was then engaged, in preparing my work "On the condition of the fibres of muscles and nerves, when irritated by contact with substances chemically opposed," often imparted a more serious direction to our conversation. It was at this period that I wrote the little allegory on vital force, called "The Rhodian Genius." The predilection which Schiller entertained for this piece, and which he admitted into his periodical, *Die Horen*, gave me the confidence to introduce it here. (Humboldt 1850/1896, 27)[2]

Humboldt's work involved precise physiological experiments and more whimsical musings about *Lebenskraft* (see Millán Brusslan 2022). Questions about the nature of the forces of life guided some of the experiments he conducted on his very own body; speculation about nature was always balanced with concrete empirical experimentation. Humboldt approached the phenomena of nature with the empirical scientist's quest to quantify and so master the objects of his study. But he knew that to address the issue of nature's meaning for us, something more than data collection was necessary. Experimentation and speculation mix and fuse in Humboldt's work, a fusion that could have led Humboldt to the territory of *Naturphilosophie.* Yet Humboldt's relation to *Naturphilosophie* was ambivalent – from an early zeal for Schelling's *Naturphilosophie* (in his *Ideen zu einer Geographie der Pflanzen* [Humboldt 1977], he explicitly states that there is no need for any conflict between empiricists and *Naturphilosophen*) to a later rejection of the same (in his *Kosmos* [Humboldt 1845]). Certainly, some thinkers of Humboldt's generation were guilty of replacing experimentation with empty speculation.[3] Humboldt and Schelling, a sort of poster boy for *Naturphilosophie*, had what Petra Werner has so well described as a tension-filled relationship

[2] An excellent recent translation is done by Mark W. Person (Humboldt 2014). The introduction, *Reclaiming Consilience*, by Dassow Walls, Jackson, and Person is especially valuable. While I have used the Otte and Bohn translation (Humboldt 1850/1896), I also provide the Person pagination so that readers can compare the two. For the German original, see Humboldt 1987.

[3] For more details on these thinkers and their flights of speculation, see Snelders 1970.

(*wiedersprüchliches Verhältnis*), in large part due precisely to their different views of *Naturphilosophie* (Werner 2000). In the foreword to *Ideen*, while stating his goal in the work on the geography of plants, namely, to get at a view of nature that will include its inner workings (*ihrem inner Zusammenwirken*), Humboldt makes reference to Schelling. He hopes that his work will demonstrate that it is possible to

> present canvasses of nature of a completely different and at the same time higher kind, in a *naturphilosophisch* (nature-philosophical) way. . . . Not entirely unacquainted with the spirit of Schelling's system, I am far from the opinion that true [*ächte*] *naturphilsophische* study harms empirical investigation and that empiricists and *Naturphilosophen* must be engaged in eternal battle. (Humboldt 1977, iv–v)[4]

What does Humboldt have in mind when he speaks of an *ächte Naturphilosophie*? Empirical study, that is, a grappling with the phenomena of the natural world, a grappling in which one would get one's hands dirty, would be central to this true *Naturphilosophie*, so it could not be purely speculative. Empirical experiments were a necessary element of Humboldt's view of what *Naturphilosophie* should be, for anything other than an authentic or true *Naturphilosophie* could harm the empirical investigation of nature. What are the harms posed by the inauthentic *naturphilosophische* study of nature? An inauthentic *naturphilosophische* study of nature would be one that did not provide precise empirical knowledge of nature and so would remove us from the facts on the ground, a problem to which we turn as we discuss Hegel's views of America. To his credit, Humboldt was also aware of the harm to our investigation of nature that came from what he dubbed a "vicious empiricism" (*rohe Empirie*). The most serious harm inflicted by a "vicious empiricism" would be the suffocation of the "living breath of nature."

Humboldt, committed as he was to a presentation of nature that would not kill its living breath, was after a way to present nature as *both* an empirical realm to be mastered and as a realm of freedom (indeed, he defines nature as the realm of freedom [*Reich der Freiheit*] that was beyond mastery). Humboldt emphasized in his work that empiricism is vicious only when it is deployed as the *only* way to understand nature, a way to dominate the forces of nature and tell just one side of the story of nature's meaning.

In the late 1700s, before embarking upon his American Voyage, Humboldt spent time with Goethe and members of the early German

[4] All translations are mine, unless otherwise stated.

Romantic (*Frühromantik*) circle, and the exchanges of thought he had with these thinkers influenced his approach to nature.[5] Humboldt's travels to America took him and his collaborator, Aimé Bonpland, to Venezuela, Colombia, Ecuador, Peru, Mexico, Cuba, and the USA. His account of that voyage is recorded in Humboldt and Bonpland (1816–26). Unlike many of his European contemporaries, his views of America were based on detailed encounters with the place and its people. He was often irritated by the material that was delivered on America to European audiences, for it was based on Eurocentric stereotypes rather than accurate accounts. Hegel's views of America, as expressed in his lectures on history, were particularly vexing to Humboldt. I turn to those views now, for they can be used to highlight an important set of contrasts between Humboldt's and Hegel's approaches to nature.

## 3.2 Hegel and Humboldt on America

In Berlin, in 1822, Hegel lectured about America without ever having stepped foot on the continent or consulted Humboldt's first-hand accounts of the region. Hegel's Eurocentric lens created just the sort of hierarchy that began during the colonial period and remains a problem today. He writes:

> The main character of the native Americans is a placidity, a lassitude, a humble and cringing submissiveness toward a Creole, and even more toward a European – and it will take a long time for the Europeans to produce any feeling of self-confidence in them. The inferiority of these individuals in every respect, even in regard to size, is very apparent. Only the extremely southern tribes, in Patagonia, are stronger by nature, but they are still in the natural condition of barbarism and savagery. (*IPH* 85)[6]

The image of America as the dwelling place of beasts and barbarians was not unique to Hegel; he was just one of a number of myopic intellectuals responsible for disseminating distorted views of America. Hegel may have had much to teach his students about the structure and workings of *Geist*,

[5] In March and December of 1794, April of 1795, and December of 1797, Humboldt was in Jena and Weimar and visited Goethe, Schiller, Schelling, and the Schlegel brothers.

[6] "Sanftmut und Trieblosigkeit, Demut und kriechende Unterwürfigkeit gegen einen Kreolen und mehr noch gegen einen Europäer sind dort der Hauptcharakter der Amerikaner, und es wird noch lange dauern, bis die Europäer dahin kommen, einiges Selbstgefühl in sie zu bringen. Die Inferiorität dieser Individuen in jeder Rücksicht, selbst in Hinsicht der Größe gibt sich in allem zu erkennen; nur die ganz südlichen Stämme in Patagonien sind kräftigere Naturen, aber noch ganz in dem natürlichen Zustande der Roheit und Wildheit" (*VGPh-L* 140).

offering them a "*Wald von Ideen*" (forest of ideas) and important insights about the historical nature of philosophy, but his lectures on America were bound to mislead students.[7] It is no great surprise that one does not find monuments of Hegel in the plazas of Mexico or Venezuela, or streets honoring Hegel. In contrast, vestiges of Humboldt's legacy are ubiquitous in America, where he was once most fondly referred to as the "filósofo viajero" ("traveling philosopher").[8]

Though not often heralded as a philosopher of any sort, the title of "traveling philosopher" suits Humboldt well. We can also speak of him as a "philosophical traveler." Michael Dettelbach makes a valuable connection between travel, physiology, and aesthetics, emphasizing that: "attending to the effects of the tropics on one's own physiology (including aesthetic effects) was critical to establishing one's authority as a philosophical traveler" (Dettelbach 2005, 43). Humboldt did indeed attend to the effects of the Latin American landscape on his own physiology. Humboldt wanted his readers to feel the aesthetic effects that had made such an impact upon him during his exploration of the equinoctial regions of the earth, and the development of an entirely new literary genre, the *Naturgemälde*, was one way he tried to give his readers an accurate sense of the tropics as he experienced them.[9] Certainly, travel is a crucial dimension of Humboldt's work. Humboldt traveled to America and then presented scenes of American nature to his readers. Humboldt's travel spared him the sorts of errors made by Hegel in his description of America. We can recall Humboldt's worry about Hegel's writings on America, namely, that "the most dangerous *Weltanschauung* is the *Weltanschauung* of people who have not looked at the world" (quoted in Osten 1999, 18).

Humboldt was well aware that the story of nature did not begin or end in Europe. In place of hierarchies and strict borders between disciplines, what we find in Humboldt's work is a commitment to the view that nature is best served when our investigation of it is guided by a variety of disciplines (science, philosophy, art) joining together in new ways, with

[7] For more on Humboldt's critique of Hegel's lectures, see Humboldt 1860, Letters 29 and 30, pp. 43–45. The reference to a "Wald von Ideen" comes from Letter 30. Ottmar Ette provides a detailed analysis of Humboldt's critique of Hegel in his recent book. See Ette 2002. I thank Ulrich Päßler for bringing the letters and Ette's book to my attention.

[8] From a letter to Humboldt from Francisco de Arango, dated July 30, 1827 (unpublished manuscript). With thanks to the Alexander von Humboldt Forschungsstelle, Brandenburgische Akademie der Wissenschaften, for access to this letter and others.

[9] Humboldt's collection of the scenes of nature he experience in America are presented in his *Ansichten der Natur* (1807).

no privileged center (of a geographical, cultural, or disciplinary sort) to serve as the standard against which all else is judged.

Had Humboldt delivered his *Political Essay on the Kingdom of New Spain* in a series of lectures (as he did his *Kosmos* work at the *Singakademie* in 1827–28), the listeners would have received a much more accurate and favorable view of the natives than the one offered by Hegel. In this *Essay*, Humboldt writes:

> The natives were hunters and shepherds, and they withdrew as the European conquerors advanced towards the north. Agriculture alone attaches man to the soil and develops love of country. Thus we see that in the . . . part of Anáhuac, in the cultivated region adjacent to Tenochtitlán, the Aztec colonists patiently endured the cruel vexation exercised towards them by their conquerors and suffered everything rather than quit the soil which their fathers had cultivated. (Humboldt 1972, 47; cf. Humboldt 2019, 234)

Instead of lassitude and submissiveness, Humboldt finds dedication and loyalty in the character of the natives of New Spain. And in addition to highlighting the virtues of the natives of the region, Humboldt also reminds the reader of European cruelty, leading us to question Hegel's claim that it is the natives who are barbaric and savage. Unlike Hegel, who generalized about America without ever having set foot on that continent, Humboldt carefully studied the flora, fauna, and culture of America, and his observations were based on what he saw, measured, and experienced. Indeed, as he was to write in a letter to Varnhagen von Ense from July of 1837, when discussing his views of Hegel's *Lectures*, "for a person like me, who is drawn much like an insect to the ground and its diversity, an abstract claim of purely false facts and views of America . . . is a threat to freedom and most alarming" (Humboldt 1860, 44; cited in Ette 2002, 40n47). Given that Humboldt defines nature as "the realm of freedom," a view of America that is based on purely false facts kills not only truth but also the very meaning of nature, because such falsehoods are a threat to freedom and so to the life of nature itself. As Ette observes, Humboldt would have been most queasy (*mulmig*) upon reading Hegel's generalizations about America and its people, for the heart of Humboldtian science is *not* the placement of empirical data into a preconstructed system of ideas but rather the "living relation between analysis and synthesis, between the collection of data and generalizations of that data, between particular observations and general conclusions."[10] An emphasis on and respect for

[10] "Humboldt, der zu den von Hegel hier am Ende seiner Vorlesung angesprochenen Studenten gehört haben könnte, mochte es beim Gedanken an diesen Weltgeist, wie sehr er auch aus antiken

the living forces of nature was indeed a salient feature of Humboldt's approach to America and an essential element of his openness to the land and people of America.

Humboldt did not fall into the trap that marks Hegel's approach to America: that of a Eurocentrism that blinded him to the cultural contributions of America. Humboldt was aware that his views of America diverged from those of many of his contemporaries, and he was even able to joke about this. In 1837, he writes to Varnhagen von Ense that, "I have organized my life in a truly bad way. I am doing everything to become stupid quite early. I enthusiastically renounced European beef, which Hegel finds to be so much better than American beef, and lived next to the weak and powerless crocodiles" (Humboldt 1860, 44; cited in Ette 2002, 40n47). Humboldt's views did indeed clash with those of Hegel's – but America's leading nation builders did not find anything stupid in the views of our "filósofo viajero" – indeed, his views were received with great respect and admiration. Furthermore, Humboldt's view of nature found a supporter in Theodor Adorno.

### 3.3 Natural Beauty in Hegel and Humboldt

Humboldt's contributions to our understanding of nature have been largely ignored by philosophers, even by thinkers who work specifically on the aesthetic appreciation of nature, a topic that is explicit in his work. Adorno, in an act of rebellion against the style of philosophy conducted by Hegel, addresses and supports Humboldt's work. Humboldt's work on nature is lauded by Adorno, who tells us that:

> Humboldt occupies a position between Kant and Hegel in that he holds fast to natural beauty yet in contrast to Kantian formalism endeavors to concretize it . . . [H]e presents a critique of nature that, contrary to what would be expected one hundred and fifty years later has not become ridiculous in spite of its earnestness . . . Humboldt's descriptions of nature hold their own in any comparison. (Adorno 1997, 73)

Adorno moves from talk of natural beauty to a reference to the critique of nature and finally to descriptions of nature. This movement occurs in

Quellen schöpfte, etwas mulmig geworden sein. Nicht die 'Einpassung' vorhandenen Materials in vorgefertigte Denksysteme, sondern die lebendige Beziehung zwischen Analyse und Synthese, zwischen Datensammlung und Generalisierung, zwischen partikulären Beobachtung und stets vorläufig bleibender Schlußfolgerung, die immer auf einer vergleichenden Vorgehensweise basierte, bildeten die Grundlage der Humboldtschen Wissenschaft" (Ette 2002, 41).

Humboldt's work as well as he discusses the beauties of nature, presenting a critique of nature that is born of detailed descriptions of nature that come *insektartig*, from the ground up. What Adorno finds of great value in Humboldt's writing on nature is the emphasis on natural beauty. According to Adorno, natural beauty was repressed by a series of displacements that took place in philosophy beginning with Kant and culminating with Hegel. In *Aesthetic Theory*, while lamenting the disappearance of natural beauty from the realm of aesthetics, Adorno emphasizes the significant consequences the idea of freedom and its place in a given philosophical system have upon the role of the subject in descriptions of the world. The disappearance of natural beauty from the realm of aesthetics was the result of what Adorno says was "the burgeoning domination of the concept of freedom and human dignity, which was inaugurated by Kant and then rigorously transplanted into aesthetics by Schiller and Hegel; in accord with this concept nothing in the world is worthy of attention except that for which the autonomous subject has itself to thank" (Adorno 1997, 62). Adorno's trenchant critique, one that indicts Hegel for the repression of natural beauty, recalls Hegel's own critique in the preface of the *Differenzschrift*:

> [T]he dignity that is beginning to be accorded, more or less clearly or obscurely, to poetry and art in general in their true scope – indicate the need for a philosophy that will recompense nature for the mishandling that it suffered in Kant and Fichte's systems, and set Reason itself in harmony with nature, not by having Reason renounce itself or become an insipid imitator of nature, but by Reason recasting itself into nature out of its own inner strength. (*Diff.* 83/*GW* 4: 5)

It is important to note that Hegel connects the move to recompense nature with its proper value to a philosophy of poetry and art; yet the saving touch will be offered by reason recasting itself into nature. This sort of recasting brings us precisely to the problem articulated by Adorno; even in the move toward nature that Hegel makes, even as he claims to be saving nature from its mishandling in the systems of Kant and Fichte, Hegel is not able to see nature as something independent of human reason or subjectivity. For Humboldt, understanding nature and appreciating its beauty is not a matter of what the autonomous subject grants to nature but rather a more Spinozistic position that we are just finite parts of an infinite whole that is much greater than we are: Subjectivity and objectivity are balanced. For Humboldt the sum of all of nature's forces and development is nothing less than the Cosmos, certainly not something at all dependent upon what the autonomous subject does or does not do (alas, as we have learned, the

earth and everything that is in it can be terribly harmed by what humans do).

In 1804, upon his return from his American voyage, Humboldt was welcomed back to Europe as a figure uniquely situated to present the exotic and unfamiliar territories of America to Europeans. He did indeed, as Goethe's character Ottilie comments in *Elective Affinities*, "describe and represent the strangest and most exotic things in their locality, always in their own special element, with all that surrounds them" (Goethe 1854, 172). Humboldt spent the first period after his return from America (1804–27) in the "scientific capital" of his time, Paris, where he published his *Essai sur la géographie des plantes* (1807). The German edition of this book was dedicated to Goethe and has been described by Meyer-Abich as a "true spiritual companion" (*getreues geistesgeschichtliches Pendant*) (Humboldt 1977, ix) to Goethe's *Die Metamorphose der Pflanzen* (1790). Also in this period, Humboldt published his *Ansichten der Natur* (1808).

To appreciate Humboldt's work on nature, we must understand the important relation he had to Goethe. Humboldt and Goethe had a close intellectual and personal relationship. The younger Humboldt was, in some ways, the accomplished and recognized scientist that the elder Goethe never quite became. Consider what Meyer-Abich claims in his introduction to Humboldt's *Ideen zu einer Geographie der Pflanzen*: "One is not guilty of overstatement about the natural sciences in the Age of Goethe, if one claims that Goethe was the inaugurator and Humboldt the person who perfected the natural sciences" (Humboldt 1977, ix) – this claim is part of a well-established pattern of discussing the scientific work of Goethe and Humboldt by way of a common historical horizon.

Both Goethe and Humboldt fused art and science in a seemingly effortless way (and a way that continues to bewilder scholars in our overspecialized times).[11] While Humboldt's scientific work does not raise the same sorts of doubts as Goethe's did (i.e., is he a scientist or just a poet who derived pleasure from dabbling in science?), we do find in Humboldt's work a unique blend of the aesthetic with the scientific, a blending that has caused not only a forgetting of his work but, as Laura Dassow Walls has argued, a kind of erasure (Dassow Walls 2014, 247). As Dassow Walls observes:

[11] I am not the first to find an important connection between the work of Alexander von Humboldt and Goethe. For an excellent collection dedicated to this very topic, see Jahn and Kleinert 2003. I thank Ulrike Leitner for bringing this collection to my attention.

> [Humboldt's] absolute absence suggests more an active excision than a mere lapse – not merely a forgetting but an erasure. . . . Humboldt championed aesthetic forms that emerged from the particulars of nature, and scientific forms that embraced, rather than excluded, the subjectivity of the observer. This put him on a collision course with the emergent concept of "objectivity," such that Humboldt's bold, experimental texts were absorbed, reshaped, and in large part silenced by the split we have come to know as "the Two Cultures." (Dassow Walls 2014, 247)[12]

In Dassow Walls' observation we find important clues for unpacking the features in Humboldt's work on nature that push the *Naturforscher* into the territory of the *Naturphilosoph*. In his championing of "aesthetic forms that emerged from the particularities of nature," Humboldt moved from the empirically driven realm of the natural scientist (*Naturforscher*) to the realm of *Naturphilosophie*, which in his work emerges as a way to present nature as a realm that can be dominated, but which is also, always, a realm of freedom, and so beyond the controlling grasp of the human. Humboldt's writings on nature are an attempt to balance these two aspects of nature. Unlike Schelling, who takes us back to his theological roots with his presentation of nature, the speculative aspects of Humboldt's presentation of nature do not bring us to any divinity (in fact, an early review of his *Cosmos* critiqued the absence of the term "God" from the book). Humboldt's path away from the empirical realm of nature delivers us to the aesthetic realm, which is a celebration of human subjectivity in its freedom. Humboldt's approach to nature did indeed embrace the subjectivity of the observer and with that embrace departed from a strictly empirical approach to nature. Yet he did not allow the human subject to eclipse nature. In his work, Humboldt also pushed for an embrace of new landscapes and practices, providing a break from the typical Eurocentric rejections of America by so many of his contemporaries.

Both Goethe and Humboldt are after a method of presentation of nature (*Darstellung der Natur*) that will enable them to "see" the inner unity of nature, a unity that cannot be captured through the methods of the natural sciences alone. Although there is no poetic tribute to Goethe found in Humboldt's work, sincere dedications to and gratitude for Goethe's influence abound in his work. Humboldt was quite fond of Goethe. Indeed in 1828 at a large, international gathering of scientists in

[12] As Dassow Walls puts it, the term "the Two Cultures" is an "unforgettable term coined in a forgettable lecture by C.P. Snow" (2014, 257).

Berlin, *Versammlung Deutscher Naturforscher und Ärzte*, Humboldt undoubtedly surprised the audience when he named Goethe as first patriarch (*erster Patriarch*) of the sciences. Humboldt told the audience that the great creations of Goethe's poetic fantasy (*dichterischer Phantasie*) had not kept him from immersing a researcher's gaze (*den Forscherblick*) into all of the depths of the life of nature (*alle Tiefen des Naturlebens*). Böhme points out that while Humboldt's deferential nod to scientists such as the astronomer Wilhelm Olbers (1758–1847), anatomist Thomas Sömmerling (1755–1830), or Humboldt's teacher in Göttingen, the well-known physiologist and natural historian Friedrich Blumenbach (1742–1840), was followed by details regarding their scientific contributions, his endorsement of Goethe's "Blick in die Tiefen des Naturlebens" was delivered to the audience at the scientific gathering without further elaboration (Böhme 2002, 168). How can one elaborate on the *Blick in die Tiefen des Naturlebens*?

### 3.4 Goethe, Humboldt, and the Problem of *Darstellung*

For Humboldt and for Goethe, the presentation of nature is both a scientific and an aesthetic task, and in this blending there are moves toward a *Naturphilosophie*. *Darstellung* is not an uncomplicated term in the work of either thinker. With respect to Goethe's work, Agnes Arber points out:

> For the type of explanation based on cause and effect, Goethe substituted a process that can be described only by the untranslatable German word, "Darstellung," which may be defined, approximately, as the demonstration or representation of an object, brought into relation with others in such a way that its significance is revealed. (Arber 1946, 85)

Arber's emphasis on the important role that Goethe gives to *Darstellung* as a way to create a *Zusammenhang* or context for understanding elements of nature in relation to one another is well placed. This emphasis on *Darstellung* as a way to allow the relations between objects of nature to emerge is found in Humboldt's work as well. As Arber observes, "Goethe himself spoke of morphology as a discipline which 'merely presents and will not clarify" (*nur darstellen und nicht erklären will*)" (Arber 1946, 85). For both Goethe and Humboldt, getting at the unity of nature is essential to presenting nature, for said unity allows the *Zusammenhang* of nature to unfold and the work of *Darstellung* to be accomplished. We can draw a line between what Goethe and Humboldt have in mind with the "unity" of nature and what Schelling had in mind when he made the following claim:

"Nature should be visible spirit, spirit should be invisible nature. Hence it is here in the absolute identity of spirit in us and of nature out of us that we must solve the problem of how nature out of us is possible" (*HKA* I/5: 107). Neither Goethe nor Humboldt is concerned with the question of how nature *outside of us* is possible, for the I is not their reference point. One reason, for example, that Humboldt emphasizes the empirical aspect of coming to an understanding of nature is because he begins with what is there in the world to see, to measure, to experience. The *außer uns*/*in uns* distinction is just *not* an issue for Humboldt or for Goethe. The *Geist* of which Schelling speaks is a much different sort of *Geist* than the one which surfaces in, for example, Humboldt's talk of the "spirit of nature." It is a mistake to categorize all thinkers who speak of the *Geist der Natur* as idealists. The spirit of nature in Goethe and Humboldt is closer to what Werner Heisenberg describes as something similar to the molecules of molecular biology: They cannot be seen with our "usual" eyes, but they are not merely images of the mind. In the work of Goethe and Humboldt, the spirit of nature emerges from the objects of nature, not, as seems to be the case in Schelling's work, from the I. Goethe certainly did exert an influence on prominent German idealists of the period, and I do not want to disconnect Goethe and Humboldt from German idealism tout court, but I do think that it is important to note where there are significant differences in the philosophical commitments of Goethe and Humboldt, on the one hand, and thinkers such as Schelling and Hegel, on the other.[13]

The work of *Darstellung* does, in the long run, explain many more aspects of nature than a lonely, isolated scientific explanation would be able to do. The work of *Darstellung* is not merely an empirical task but is, in Goethe and Humboldt, always at least empirical. So whatever Humboldt's notion of *Naturphilosophie* is, it would never be an approach to nature guilty of what he so bitterly complained of in his letter to Varnhagen, namely, "a chemistry in which one does not get one's hands wet" (*eine Chemie in der man sich die Hände nicht nass machte*) (Humboldt 1860, 90, quoted in Snelders 1970, 193). Steuer stresses the difference between "the more speculative of the Romantics" and Goethe's "insistence on empirical evidence and demonstration" (Humboldt 1860, 90, quoted in Snelders 1970, 193), an insistence shared by Humboldt. In order to

[13] For more on Goethe's relation to German Idealism, see Millán Brusslan and Smith 2011. For the important connections between *Naturphilosophie* and Kant, see Beiser 2006. For an excellent account of Schelling's *Naturphilosophie* and relation to German Romanticism, see Richards 2002.

present nature, knowledge of the laws that govern living organisms is necessary, but so is an understanding of the idea of freedom. For Humboldt nature is a realm in which law and freedom blend. Nature for Humboldt is "the realm of freedom" (*das Reich der Freiheit*; trans. revised) (Humboldt 1845, 4; Humboldt 1977, 1:23). Humboldt emphasized that nature is, "as Carus [Carl Gustav Carus (1789–1869)] so pointedly claimed and as the word itself indicated to the Romans and Greeks, that 'which is conceived as eternally growing, eternally developing and unfolding'" (*das ewig Wachsende, ewig im Bilden und Entfalten Begriffene*).[14] Humboldt saw a common challenge facing all of those who wanted to present nature, be the presenter an artist or a scientist: "In scientific circles as in the circles of landscape poetry and painting, the presentation gains clarity and objective liveliness when the parts are determined and limited" (Humboldt 1845, 12–13). The landscape artist *and* the scientist need to use empirical methods: "The landscape artist and the scientist need to use empirical methods: Humans cannot have any effect on nature or get close to any of her powers, if they do not have knowledge of the laws of nature according to relations of measurements and data" (Humboldt 1845, 36). When nature is considered rationally, we get to its unity: "In thoughtful contemplation, nature is unity in multiplicity, the connection of the manifold in form and composition (*Verbindung des Mannigfaltigen in Form und Mischung*), the essence of natural phenomena (*Naturdinge*) and forces of nature as a living whole" (Humboldt 1845, 5–6, cf. 24). This theme of connection in nature is a central theme in Goethe and Humboldt's *Darstellung* of nature. Both thinkers strive to combine the empirical or measurable elements of nature with those elements that are "measureless to man."

Hegel too, at least in the view of some scholars, was attempting to balance philosophy and the natural sciences as he presented his view of nature. Adorno's critique leaves us with a vexing question: For Hegel, is the structure of the philosophy of nature determined a priori by self-determining reason or a posteriori by the findings of science? From Humboldt's standpoint, if Hegel is not willing to get his hands dirty with experiments that test his views of nature, his philosophy of nature will remain too removed from the life of the earth; too speculative, in short, it would amount to a version of bad *Naturphilosophie*.

[14] Carl Gustav Carus and Humboldt shared common interests in science and in landscape. See Carus 2002.

## 3.5 Variations on Naturphilosophie

In *Consilience*, Edward O. Wilson claims that a unified system of knowledge is "the surest means of identifying the still unexplored domains of reality" (Wilson 1998, 326). While Wilson lauds Goethe for his "noble purpose," namely, "[to couple] the soul of the humanities to the engine of science," he distances Goethe's "noble purpose" from the work of the *Naturphilosophen*. *Naturphilosophie* is defined most dismissively by Wilson as "a hybrid of sentiment, mysticism, and quasi-scientific hypothesis" (Wilson 1998, 39). I do not endorse this dismissive characterization of *Naturphilosophie*, believing instead that like art, there can be good *Naturphilosophie* and bad *Naturphilosophie*. The bad sort of *Naturphilosophie* involves an approach to nature that remains merely speculative, with the hands of the investigator remaining far from the dirt of the earth, and so all too clean.

Goethe and Humboldt were aware, long before our present age of interdisciplinarity, that certain concepts could best be approached by a perspective that drew from a variety of disciplines and methods, rather than just one. Both Goethe and Humboldt wanted to free science from the narrow boundaries of the specialist and make it something that would be intelligible to all thoughtful people. Yet they were not willing to unhinge their philosophy of nature from the findings of science. The departure from the role of science in our understanding of nature is what gave *Naturphilosophie* a bad name in certain scientific circles.

As Humboldt never tired of reminding us, humans cannot have any effect on nature; get close to any of her powers, if they do not have knowledge of the laws of nature according to relations of measurements and data. But empirical mastery of nature is not enough:

> The most important result of a rational inquiry into nature is ... the following ... to capture the spirit of nature (*Geist der Natur*), which lies hidden beneath the mantel of appearances. In this way, our striving reaches beyond the narrow limits of the sense world, and we can succeed in mastering nature conceptually through the raw material of empirical intuition as well as through ideas. (Humboldt 1845, 6)[15]

For Humboldt, mastery is never final: We can get an approximation of mastery through empirical measurements, but the ideas that enable us to complete the process of understanding nature cannot be mastered, they are never under our dominion. Since Humboldt's notion of the mastery of

[15] The English version in Humboldt 1997, 1:24–25, is too imprecise for this passage.

nature involves the move to ideas, we see at once that there will be no domination of nature. The spirit of nature cannot be mastered, just as an idea cannot be mastered: An idea can be thought but it cannot be known or proved in the way that a fact is known or established to be true. What can the scientist present? What is Humboldt trying to do in his unveiling of nature, in his talk of capturing the spirit of nature? Humboldt describes his goal as follows: "The principal interest by which I was directed was the earnest endeavor to comprehend the phenomena of physical objects in their general connection (*allegemeine Zusammenhang*), and to grasp (*auffassen*) nature as one great whole, moved and animated by internal forces" (Humboldt 1997, 1:7, trans. revised).

Humboldt's concern for the *Zusammenhang* or general context of nature and his project of grasping nature in its unity leads to an ambitious project of presenting nature in way that will tell both stories of nature's meaning for us: the empirical, measurable story of nature and that part of the story involving nature's *Geist*, which cannot be measured, but which can be approximated via the aesthetic tools Humboldt develops and deploys. Humboldt was well aware that the precise way in which nature would be presented was crucial, for suffocating the "living breath of nature" with any narrow empirical method would make it impossible to present nature as "one great whole moved and animated by internal forces." He warns: "Descriptions of nature ought not to be deprived of the breath of life (*Hauch des Lebens*), yet the mere enumeration of a series of general results is productive of a no less wearying impression than the elaborate accumulation of the individual data of observation" (Humboldt 1997, 1:9, trans. modified)[16]

A tedious tabulation of the empirical dimensions of nature suffocates the living breath of nature, and the scientist should take care to make sure that her *Naturschilderung* is not guilty of such a one-sided account of nature. A concern for the "living breath of nature" makes Humboldt aware of the limits of the merely empirical methods of the natural sciences. In order to grasp the deepest connections of nature, to grasp the spirit of nature, something more is needed. When we glimpse the deep connections of nature, then, "[o]rganic forms that had long remained isolated, both in the animal and vegetable kingdom, [are] connected by the discovery of intermediate links or stages of transition" (Humboldt 1997, 1:50)[17] and

[16] "Den Naturschilderungen darf nicht der Hauch des Lebens entzogen werden, und doch erzeugt das Aneinanderreihen bloss allgemeiner Resultate einen eben so ermüdenden Eindruck also die Anhäufung zu vieler Einzelheiten der Beobachtung" (Humboldt 1845, viii).

[17] "Pflanzen und Tiergebilde, die lange isoliert erschienen, reihen sich durch neu entdeckte Mittelglieder oder durch Übergangsformen aneinander" (Humboldt 1845, 31).

the unity of nature is unveiled. Humboldt was an empirical scientist, dedicated most assiduously to precise data collection and measurements, but he realized that to come to a fuller understanding of nature, he had to go beyond the merely empirical data to the sort of unity to which he makes reference in the lines just cited. Böhme points to the following tension in Humboldt's work:

> On the one hand, we find the scientist, who with strict empiricism (*mit einem strikten Empirismus*) advanced the emancipation of the natural sciences from philosophy . . . On the other hand, we have the man, who with literary and philosophical concepts developed around 1800, concepts of the beautiful and the sublime, tightly clings to the idea of a homogenizing totality between humans and nature (*unverdrossen an der Idee einer Mensch und Natur homogenisierenden Totalität festhält*). (Böhme 2001, 20)[18]

In this description, we find the path Humboldt took to emancipate the natural sciences from philosophy, and then the push to bring the natural sciences back again to philosophy through his aesthetic turn. Humboldt's goal is to present the results of his scientific investigation within a wider historical/cultural context and connection:

> The person who considers (*betrachtet*) the results of her study of nature (*Naturfoschu*ng), not in their relation to the individual levels of cultivation (*Bildung*) or in relation to the individual needs of social life, but rather in their grand relation to the whole of humanity, is offered as the joyful (*erfreuliche*) fruit of this research the benefit (*Gewinn*) that through the insight into the connection of the phenomena (*durch Einsicht in den Zusammenhang der Erscheinungen*), the pleasure (*Genuss*) taken in nature is increased and ennobled. (Humboldt 1997, 1:23, trans. significantly modified)[19]

The purely empirical scientist or *Naturforscher* does not get to the *Zusammenhang der Erscheinungen* or to the pleasures such insight into the inner connections of nature yields. There is an empirical story that needs to be told as we explore nature, but Humboldt never tires of reminding us that the empirical, measurable story of nature is only part of the story – for the beauty, grandeur, and deeper joys of nature to be revealed, we must go beyond mastery of nature to appreciation of what it

[18] "Auf der einen Seite finden wir den Wissenschaftler, der mit einem strikten Empirismus die Emanizipation der Naturwissenschaft von der Philosophie befördert . . . Auf der anderen Seite finden wir einen Mann, der mit den um 1800 literatursprachlich und philosophisch entwickelten Formeln des Schönen und Erhabenen unverdrossen an der Idee einer Mensch und Natur homogenisierenden Totalität festhält."

[19] For original, see Humboldt 1845, 4.

offers. We need, in short, to understand (or at least attempt to understand) the living breath of nature.

## 3.6 Concluding Remarks

As I hope has become clear, Humboldt's and Hegel's contributions to our understanding of nature come into sharpest focus when we read them within the context of a rich period of scientific and literary developments that took shape in the late 1700s into the early 1800s in German-speaking lands. Goethe's work is of particular importance in shedding light on a cluster of ideas that opened new views of nature. Goethe and Humboldt shared a concern for unity in nature, a unity approximated by the notion of the *Urpflanze* or the *Naturgemälde*, notions anchored to the empirical methods of the natural sciences but not bound by such methods. For bondage to the methods of the natural sciences would sabotage another important aspect of their approach to nature, namely, an attempt (to use E. O. Wilson's phrase) to couple the soul of the humanities to the engine of science. In order to appreciate the contributions that Hegel and Humboldt made to our understanding of nature, we must see that while empirical, quantifiable aspects of nature were central to their work as *Naturforscher* or investigators of nature, neither thinker endorsed an empirically reductionist approach to understanding nature: A strong commitment to moving science beyond the charts and graphs of the measurable in order to uncover the meaning and value of nature is found in the work of both thinkers. Hence, the speculation that characterizes *Naturphilosophie* of the period is part of their approach to nature. What the botanist Agnes Arber said of Goethe, namely that "he was a great biologist who, in the long run, overstepped the bounds of science" (Arber 1946, 86),[20] is also true of Humboldt. Hegel might be faulted for not taking the empirical side of nature seriously enough, a problem that I have illustrated by way of his views of America. In keeping his hands clean, Hegel remained too distant from the very phenomena of nature (the people and landscape of America) that he sought to present. Humboldt successfully overstepped the bounds of empirical sciences to reach a richer field from which to contemplate nature, but he was always drawn back to the messy, empirical matters of the earth, where he was most certainly not afraid to get his hands dirty.

[20] Arber's claim would have Goethe spinning from joy in his grave, for the claim recognizes that Goethe was, in the first place, a scientist, something still open to debate.

CHAPTER 4

# *On Hegel's Account of Nature and Its Philosophical Investigation*

*Marina F. Bykova*

A primary objective of Hegel's Philosophy of Nature is the systematic organization of our fundamental ontological and natural scientific concepts and principles, beginning with the most abstract and universal ideas, such as space and time, and proceeding through a meticulously structured sequence of steps toward organic life and its most complex level of organization reached in animal species, ultimately culminating in the consideration of intelligent (thinking) life. Hegel's task is to organize and understand this conceptual content as the process of "mapping" the whole, and this "whole" is Nature and its composition. As a result, the question of Hegel's understanding of Nature emerges as a central and profoundly significant inquiry, deserving – careful examination. It is, however, a complex question, and its analysis encompasses both historical and systematic viewpoints. At its very basic level, this inquiry revolves around the question of the reality of Nature, and granting or denying Nature's reality becomes a complex task, particularly in light of Kant's contributions and the solutions he offered in his metaphysics of Nature. Similarly, the architectonic of Hegel's philosophical system that unfolds through the progression of Idea, Nature, and Spirit presents a systematic challenge.

As is commonly recognized, Hegel places significant emphasis on the Concept's continuous development, which is a vital aspect of his philosophical system. From a systematic standpoint, Nature is the Idea in its external manifestation, in the form of "otherness," and thus, "the Idea is present in each grade or level of Nature itself" (*Enc.* 2 §247A, trans. modified). This is widely interpreted as implying that the philosophy of the Idea cannot provide an account of the true essence of Nature, an account of what Nature ultimately is. The realm of the Idea extends beyond the boundaries set by the Logic, permeating other parts of the system. On this reading, Nature is never able to maintain its independent reality and instead functions solely as an extension of the Idea, with no

intrinsic significance beyond this role.[1] This interpretation, widely accepted even today, has been referred to by Donald Verene as the "'idea-ization' of nature" (Verene 1998, 212).

Another equally challenging issue is that even if we acknowledge that, in Hegel's system, Nature possesses an independent reality and it cannot be reduced to a mere "function" or "mirror" of the Idea, there still persists a skeptical and often dismissive treatment of Hegel's theory of nature in contemporary scholarship (e.g., Pippin 2002, 60ff.). For many, Hegel remains nothing more than that "arrogant and ignorant German philosopher who denied evolution and who . . . 'proved' *a priori* that there could be only seven planets . . . between the orbits of Mars and Jupiter" (Houlgate 1998, xi). Consequently, the specific ideas and concepts that Hegel presents in his philosophy of nature not only face suspicion and criticism but are also denied scholarly significance, particularly in terms of their scientific relevance. Therefore, it is no surprise that while the discussion of the philosophy of nature as a structural component of Hegel's system garners some attention among scholars, there is not much literature dedicated to its actual content and the account of nature that emerges from it.

This chapter seeks to counter a largely dismissive treatment of Hegel's conception of nature as being insignificant from both philosophical and natural scientific perspectives. It aims to illustrate that Hegel not only offers a thoughtfully grounded and compelling view of nature but he also contributes novel insights regarding the course and internal processes of its development. These insights persist in shaping our comprehension of the natural world, underlining the enduring relevance of Hegel's exploration of nature.

I begin my discussion (1) with a brief overview of Schelling's *Naturphilosophie* and the perspective it offers on the concept of nature. Since Hegel's own ideas about nature were significantly shaped in response to Schelling's work, understanding this historical context is crucial for the analysis I am proposing. Subsequently, I delve into a comparative examination of Hegel's views on nature versus Schelling's, which should help underscore the fundamental differences in their approaches. Furthermore, I (2) address the charge of the alleged apriorism of Hegel's system and his philosophical investigation of nature. This should allow me to clarify the goals he pursues in his Philosophy of Nature and show that his

[1] Charles Taylor views Hegel as an absolute idealist and points out that "absolute idealism means that nothing exists which is not a manifestation of the Idea, that is, of rational necessity" (Taylor 1975, 110).

ambitious project aims to reconsider nature philosophically, while critically assessing its treatment in the natural sciences (see Ferrini 2009b).[2] Hegel's systematic exposition and integration of fundamental scientific principles and concepts not only bear relevance for the natural sciences but also significantly contribute to our proper understanding of them. Following this, I (3) examine the account of nature that arises from Hegel's philosophical inquiry into the natural world. Lastly (4), I address one of the most challenging and contentious topics in the field of Hegel studies – the interpretation of Hegel's seemingly "anti-evolutionary" stance in his Philosophy of Nature. I argue that Hegel's account of nature is far from being obscure or anti-realistic (or what is commonly termed "anti-naturalist"). I further contend that he does acknowledge historical trends in nature and that his understanding of nature's development is somewhat similar to what is currently discussed in terms of "emergentism," which posits that a natural system's behavior results from both its structural organization and the material composition of its components. Hegel's emergentist agenda, infused with dialectics, aims to elucidate why and how a specific set of concepts and principles enable us to comprehend particular natural phenomena at a certain level of systematic complexity and provide the necessary foundation for progressing to the subsequent level.

## 4.1 Schelling, Hegel, and Their Views of Nature

Schelling holds a prominent position within the German tradition of a philosophy of nature, emerging as the author of the large-scale project of the *Naturphilosophie* that encapsulated an entire research program during the era often referred to as the "Romantic sciences" or *Goethezeit*. Notably, Schelling's project exerted a significant influence on Hegel's early intellectual development, particularly during their time as (still) close friends and colleagues in Jena (1801–3). Hegel's 1801 dissertation, *De orbitis planetarum* (*Diss.*), which qualified him for the position of Privatdozent at Jena, as well as his earlier (1802–3 and 1805–6) drafts of his future system, especially his *Erster Entwurf eines Systems der Naturphilosophie* (*GW* 5), reveal the imprint of Schelling's natural philosophy on Hegel's thought. Initially, Hegel embraced Schelling's project of a new *Naturphilosophie* with enthusiasm, viewing it as a much-needed response to Kant's inability to provide a philosophically sound account of nature, a challenge posed by

[2] What Hegel offers is one of the richest and most sophisticated philosophical accounts of the natural world ever produced (*Enc.* 2P, 1: 60).

the developments in the natural sciences. In the early stages of their collaboration, Hegel aligned himself with Schelling's chosen path and his conceptualization of nature. However, only a few years later, starting with his 1805–6 *Jenaer Realphilosophie* (*JS III*/*GW* 8), Hegel's independent exploration of a philosophy of nature led him to diverge from Schelling's answers. This marked a turning point where Hegel critically reevaluated Schelling's project and its outcomes, thus beginning his own distinct philosophical journey in the domain of nature.

Schelling and Hegel initially shared several important concerns, particularly their reservations about the limitations of the transcendental philosophy of nature and its inclination toward Newtonian physics. They both recognized that this philosophical framework, advanced by Kant and Fichte, fell short in adequately addressing the complexity of nature and explaining the emergence of life. In their efforts to rectify these limitations and offer a more comprehensive perspective on the natural world, they found a kindred spirit in Goethe, a prominent figure in the discussion, who vehemently argued against deterministic and mechanistic approaches to nature. While Goethe's perspective provided valuable support, Schelling and Hegel also realized that to effectively confront the existing challenges, they needed to radically rethink the very concept of nature, which would require a philosophical assessment of the findings and insights derived from scientific investigations into the natural world.

Both Schelling's and Hegel's projects emerged from their dissatisfaction with Kant's account of nature, particularly the limitations he imposed on teleological judgments in their application to organic phenomena, which led to explanations grounded in mechanical causality (*CJ* AA 5: 386–95; for more details see Rand 2010, 185–86). The goal of overcoming the understanding of nature in terms of mechanical-causal relations became the core of their projects, which nonetheless substantially diverged in terms of specific aims, methods employed, and the outcomes they generated.

Schelling's direct engagement with natural philosophy stretches over two periods in his intellectual development: one that is associated with his early *Naturphilosophie* (1797–1800) and the second one known as the Philosophy of Identity (1801–05). During the former, he was mainly concerned with the structure of the natural world, seeking to develop a new concept of nature that would acknowledge the inadequacy of a purely mechanical-causal explanation and instead account for nature's ontological independence and inherent vitality, during the latter he shifts his attention to the fundamental principles of his natural philosophy (which he termed "speculative physics" to distinguish it from empirical science), arguing – in

a manner broadly influenced by Spinoza – for the identity of mind and nature at the most fundamental level of reality, and asserting an underlying unity between the mental and natural realms. Not aiming to offer a detailed exposition of Schelling's *Naturphilosophie* here, I briefly enumerate some of its key ideas and principles that either reappear or become points of contention in Hegel's own philosophy of nature.[3]

First, by dismissing the prevailing mechanical view of nature that dominated Enlightenment-era natural science, a perspective still identifiable in Kant's philosophy, Schelling adopts an organicist interpretation, where nature is conceived of as a unified organism in which life and internal vitality constitute its core. This organic interpretation of nature implies that nature possesses an inherent reality, characterized by self-contained causality and independence from external factors. It is intrinsically dynamic, is capable of self-realization, and possesses a self-organizational capacity.

The second related idea is that the inherent dynamism of the natural world is applicable to both inorganic and organic realms. This distinguishes Schelling's stance from Kant's insistence on a rigid differentiation between matter and life capable of thought. Kant firmly maintains that matter lacks vitality and is subject to the law of inertia. Rejecting this dualistic perspective, Schelling, in his *Naturphilosophie*, seeks to establish the organic unity of nature in all its forms and manifestations and to understand how thinking life (mind [*Geist*] and human subjectivity) emerges, without resorting to Kant's dichotomy. While he agrees with Kant that the organic cannot spontaneously generate from the inorganic (as suggested by Fichte), he posits that nature itself is inherently organic, and thus the natural principles of development within nature can give rise to organic life from seemingly inorganic components. His solution is to think of the whole of nature as a "productivity." Following Spinoza, he distinguishes between nature as productive (Spinoza's *Natura naturans*) and nature as the product (Spinoza's *Natura naturata*). What we typically encounter are the "products" (*Natura naturata*) – empirical objects and phenomena, collectively forming the world. Appearing as fixed, these

[3] Schelling's natural philosophy – in both its early version as well as the subject that plays a central role in his thought throughout his career – has been extensively examined in both English and German literature. Among earlier works – more focused on the history of science, rather than the history of philosophy – are Förster 1969; Wieland 1975; Bowie 1993, 30–44. For more recent publications that pay closer attention to philosophical issues, see Fisher 2017; Franks 2020; Garcia 2021; Satoor 2022; Woodard 2020. A substantial amount of recent scholarly research has been dedicated to exploring Hegel's efforts to differentiate his philosophical project from Schelling's *Naturphilosophie*. See Grant 2008; Wandschneider 2010; McGrath 2016; Berger 2020; Rand 2010.

products can be categorized and studied under predefined rules within the domain of empirical sciences. *Naturphilosophie*, distinct from empirical natural sciences, assumes the additional task of exploring the "ground" underlying what appears and shapes these objects (products). According to Schelling, this grounding must be understood as "something non-objective" (i.e., subjective) and unconditioned (*unbedingt*) existing in nature itself, and it is "precisely the original productivity of nature" (*SW* I/3: 284) or nature as productivity (*Natura naturans*). Schelling views nature in its entirety as teeming with life and productivity. Instead of being metaphysically bound by a set of mechanistic laws, matter is inherently active, possessing the ability to self-organize and engage in dynamic processes that connect it to thinking life.

A third significant insight pertains to the concept of nature's development, which is understood as an evolutionary process marked by a gradual succession of emerging levels. Schelling elucidates this development by appealing to dynamic "potencies" (*Potenzen*), forces that "inhibit" or interact with each other, revealing their power through opposition. While he employs various fundamental processes as explanatory models for the major orders and levels, a common thread running through all of them is the presence of antagonism between negative and positive forces inherent within each "potency," holding it together. The structure of these forces is actually tripartite: two natural forces opposing each other, maintained in equilibrium by a third force. This triadic structure is exemplified in phenomena such as gravity, where repulsive and attractive forces are coupled, or in magnetism, with its polarity and reversals of polarity.[4] Their interdependent dynamics constitute a comprehensive system of "potencies" (forces) that are grounded in the "*continually operative natural activity*" and the inherent "productivity" of nature itself (*SW* I/7: 78). For Schelling, nature is in a perpetual state of (self-)transformation, and its productivity arises and remains sustainable through the interplay of polar oppositions. As Bowie explicates, "[Schelling's] *Naturphilosophie* articulates the system of nature on the basis of a fundamental principle of difference within identity" (Bowie 1993, 40). While the forces of nature simultaneously manifest opposing tendencies – expansion (associated with growth and life) and contraction (linked to decadence and death) – they coexist and act harmoniously within an organic unity, depicted as an interconnected whole. Human beings are integral components of this unified

[4] For a well-informed discussion of how Schelling conceives the working of forces see Rand 2010, 193–94.

whole, and the journey toward self-consciousness occurs within the realm of nature itself, explained by its generative forces.

The fourth crucial aspect of Schelling's *Naturphilosophie* is his understanding of nature as a sequence of evolving metamorphoses. It was Goethe who initially formulated the notion of metamorphosis (transformation) of forms within an idealist morphological framework in his *Versuch die Metamorphose der Pflanzen zu erklären* (1790), translated into English as *Metamorphoses of Plants*. Becoming acquainted with this concept through his intensive exchanges with Goethe starting from 1798, Schelling extended it beyond the realm of plants to encompass the entirety of nature, introducing the law of polarity into this framework (*HKA* III/1: 97–117; *HKA* I/7: 103f., 284–88; I/8: 55f.; see also Nassar 2010, 314–19). He viewed the products of nature as engaged in an "infinite metamorphosis," understood in a radical way as "not merely a partial but a total change" (*HKA* I/8: 55; I/7: 286). Despite perceiving natural phenomena in such a dynamic manner, Schelling attributed genuine agency only to *Natura naturans*, an unconscious productive force that is not directly observable and remains beyond the scope of "conscious" comprehension, and that reveals itself only in and through the products of nature. The achieved result is a philosophical account of nature as independent, autonomous, and self-generating. Nature's unconditioned and unconscious productivity operates within the universal framework of polarity and manifests itself through a process of continual intensification (*Steigerung*) and increase in complexity.

A fifth important idea that animates Schelling's *Naturphilosophie* is teleology. In an effort to overcome the Kantian division between mechanism and teleology leading to "the antinomy of judgements" (*CJ* §77/AA 5: 406–9), Schelling proposes an all-encompassing teleological system of nature, describing it as a "universal organism." Central to this model of nature is the idea of a self-organizing whole, a unified force from which all other forces derive. Schelling argues that similar to how an organism exhibits purposiveness within itself, the whole of nature must be understood as intrinsically purposive. In this treatment of nature as purposive, Schelling closely follows Kant, drawing heavily on the latter's conception of nature as a "system of ends" (*CJ* §82/AA 5: 426–27). However, Schelling diverges significantly from Kant's conclusions regarding the teleology of nature as a whole. First, contrary to Kant, who regarded the idea of the organic structure of nature as purely regulative, Schelling, true to his goal of explicating a "productive organization" of nature, asserts the objective and constitutive character of this idea. Second,

while Kant's teleological idea of a system of purposes leads to the postulation of a final purpose (*Endzweck*) for nature, which as an "unconditioned end" must be external to it,[5] Schelling maintains that nature possesses internal purposiveness. Like an organism, nature exists for its own sake, serving as its own ultimate purpose and functioning both as the cause and the effect within itself.[6] As a whole, it is "organized out of itself and by itself" (*SW* I/3: 17). The teleological account of nature as a "universal organism" underscores the organic structure of nature while acknowledging the diversity of particular forms within its unified organization.

In providing this overview of the key ideas of Schelling's *Naturphilosophie*, the aim has been to underscore its basic principles, particularly those that can shed light on Hegel's project of the philosophy of nature. Hegel's own exploration of natural philosophy was profoundly influenced by Schelling, and there are indeed significant parallels and similarities between their theories. One of the most fundamental commonalities is their shared commitment to dynamic holistic accounts of the natural world, which incorporate human beings within this world rather than positioning them in opposition to it. Both thinkers regard nature as an autonomous whole in which all its elements exist in organic unity. Nevertheless, despite the substantial similarities in their conceptions of nature and their shared intellectual roots, including their mutual departure from several Kantian principles, leading to superseding him in various respects (such as the principle of self-organization of nature and the attribution of a constitutive purposive structure to nature itself), there are undeniable differences between their respective programs of *Naturphilosophie*.

This topic has received considerable attention in recent scholarly literature devoted to both Schelling and Hegel (Grant 2008; Rand 2010; Wandschneider 2010; McGrath 2016; Berger 2020). However, a prevailing view assigns to Hegel an allegedly epistemological orientation toward nature, which emphasizes his occupation with the conceptual understanding of nature rather than a direct interest in nature as such, central to Schelling. This interpretation denies Hegel's concern with the existing nature itself, and charges him with a radicalization of "Kant's elimination of the natural" and having as his subject "nature as cognized by *Geist*" (Miller 2002, 24; Chepurin 2016, 302). Interestingly, this reading is

[5] For Kant, this is a human being under the moral law.

[6] Fisher rightly points out that "the change in terminology – shifting to calling nature an organism, instead of a system of ends – indicates a substantive philosophical difference" between Schelling and Kant (Fisher 2021, 546).

shared by scholars from both camps: those who hold a more sympathetic view of Hegel and those who favor Schelling. It is not my intention here to engage in this debate, but it is crucial to clarify that this interpretation fundamentally misrepresents Hegel's approach to nature. Throughout his philosophical career, Hegel remains committed to a dynamic natural realism and naturalism that he borrows from the young Schelling's ideas, and in his philosophical system, he assigns nature a fundamental ontological status. As John N. Findlay aptly points out, "there is, for Hegel, nothing ideal or spiritual which does not have its roots in Nature, and which is not nourished and brought to full fruition by Nature" (*Enc.* 2, xiii). This underscores Hegel's genuine interest in existing nature and his eagerness to engage with a picture of nature that emerges from empirical sciences and the insights they offer – a perspective akin to that of the young Schelling.

When it comes to the substantive differences between Schelling's and Hegel's philosophical treatments of nature, those primarily revolve around the two thinkers' interpretations of the transition from inorganic nature to organic life and human consciousness, specifically the manner in which life and spirit emerge. The differences become evident when examining the distinct methodologies they employ, the divergent explanatory models they utilize, and their contrasting treatments of the developmental process itself.

While in order to describe the emergence of life and spirit, both Schelling and Hegel refer to nature's movement through "levels" or "stages" (*Stufen*), they fundamentally diverge in how they understand these stages and conceptualize the movement itself. Schelling views nature as advancing through hierarchically organized "stages" (*Stufengang*), conceiving of this process in terms of dynamics of natural forces or "potencies" (*Potenzen*). He characterizes this process as nature's "self-potentiating" activity, wherein the entire process of nature's internal self-differentiation is achieved through the activity of "potentiation" (*Potenzierung*). In this context, dynamic natural forces possess the potential to intensify (*steigern*) themselves, leading to the emergence of new natural phenomena and stages in the development of nature. As inorganic forces elevate themselves to higher ("second") powers, new phenomena and properties emerge, giving rise to universal physical categories such as magnetism, electricity, and chemical processes. Continuing this trajectory, inorganic nature, when reaching even higher ("third") powers, engenders the categories associated with organic life, including sensibility, irritability, and the formative drive. This marks the transition from mechanical and physical forces to vital and living processes, signifying a progression toward higher levels of (self-) organization within nature.

Hegel perceives Schelling's *Naturphilosophie* as lacking the necessary explanatory power to fully grasp the development from inorganic nature to life and spirit. While he commends Schelling for attempting to articulate the structure of organic activity and for having "introduced forms of the concept of reason into nature" (*VGPh3*/MM 20: 426), Hegel finds Schelling's reliance on force unsatisfactory and fundamentally limited, particularly when applied to organic life, which, according to Hegel, cannot be adequately explained in terms of cause-and-effect relationships.[7] In his own philosophical treatment of nature, Hegel turns to logic, confident that the transitions within the philosophy of nature are systematic rather than natural and that this systematicity can only be captured through logic, which operates with concepts rather than representational content. At the core of Hegel's approach is the belief that nature is a realm of external relations, forming an organic whole with an implicit systematic structure and interrelated parts. The philosophy of nature's goal is to make explicit what is logically implicit. Hegel accomplishes this by presenting nature as a "system of stages [*System von Stufen*]" (*Enc.* 2 §249/GW 20: 238), where each stage represents a distinct set of conceptual relations, which serve as the determinations of nature. This perspective on nature fundamentally differs from Schelling's in at least two crucial aspects. First, it concerns Hegel's understanding of the stage-based structure of nature and what it means for him to comprehend nature in stages. Second, it involves the idea that these stages exist as a system. Unlike Schelling, whose philosophical treatment of nature entails its interpretation as "a sequence of stages" (*Stufenfolge*) developmentally linked to one another, illustrating the ascending path from simplicity to complexity and from lower to higher forms, Hegel views "stages" as "not generated *naturally* out of the other." As "external, contingent determination[s]," they are "more or less indifferent to one another" (*Enc.* 2 §249, 250/*GW* 20: 239, 239–40). Hegel's focus in the philosophy of nature is not on isolated natural singularities, such as various individual natural entities (things), but rather on explaining the universals of nature. For the "inner being of Nature is none other than the universal" (*Enc.* 2 §246A/*GW* 20: 238). Consequently, the conceptual comprehension of these universals of nature involves grasping them as stages, each describing a particular aspect of

[7] Hegel uses the concept of the animal to demonstrate that as a subject, the animal cannot enter into a cause-and-effect relationship with anything, whether it is organic or inorganic, without actively engaging with it (*Enc.* 2 §356 & A; see also Rand 2010, 196–99).

nature's structure in its externality, independently of their counterparts. This perspective makes the stages irreducible to one another.

However, this irreducibility should not be misconstrued to mean that the stages of nature exist in a complete "disunity" and have no connections to one another. If that were Hegel's standpoint, those who criticize his philosophical explanation of nature for its alleged inability to explain how development occurs in nature would have a valid point. The twist that Hegel introduces into his account of stages is that they operate as a system. While at the level of appearance, the structures of nature may not exhibit unity, at the essential – conceptual – level, the stages exist in a dialectical relationship with one another. I return to this question later when closely examining Hegel's account of nature. For now, it is important to emphasize a substantial difference in Schelling's and Hegel's frameworks in their approaches to nature. Whereas Schelling adopts a model of productivity to account for the unconditioned in nature, Hegel's philosophy of nature is framed by an inner concept that follows a logical model. This is where the issue of apriorism takes center stage.

## 4.2 Hegel's Philosophy of Nature and the Charge of Apriorism

In contemporary Hegel scholarship, there is a prevalent assumption that Hegel insists on the a priori status for his *Realphilosophie*, including his philosophical exploration of nature. This perspective is endorsed by scholars such Alison Stone, Will Dudley, John Burbidge, and Stephen Houlgate, and to some extent by Terry Pinkard, although Pinkard offers a slightly modified conception of Hegel's understanding of the a priori (see Burbidge 1996; Dudley 2003; Pinkard 2004; Stone 2005; Houlgate 2005). I would argue that the aprioristic interpretation of Hegel's philosophical system is not accurate, particularly if we continue to apply "a priori" in the vein of Kant's first *Critique*. One immediate implication of this approach for the Philosophy of Nature is that it reduces it to a specific application (to actuality) of the concepts, principles, and structures "deduced" in Logic. Such an interpretation poses a significant barrier to understanding the true place and role of the Philosophy of Nature within Hegel's system. This interpretation erroneously prioritizes the tracking of alleged a priori concepts of nature over a genuine attempt to grasp the content of those concepts (Rand 2007, 383–84). Moreover, the insistence on the apriority of the philosophy of nature results in misconceptions about Hegel's understanding of nature and makes his account of the relationship between spirit and nature incomprehensible: Spirit becomes

divorced from nature, and we end up mired in the dualism that Hegel himself seeks to overcome. Elaboration on the latter point is beyond the scope of this chapter, while the former is directly relevant to my discussion of Hegel's account of nature. However, before delving into this specific topic, it is noteworthy to consider a few points relevant to the question about the a priori status of the philosophy of nature.

Dissociating himself from all previous pseudo-versions of *Naturphilosophie*, in the Introduction to the Philosophy of Nature, Hegel makes it clear that "[w]hat we are engaged on here, is not an affair of imagination and fancy, but of the Notion, of Reason." It is "a knowledge of Nature from thought," indicating that it is a *philosophical* endeavor, not an empirical one (*Enc*. 2 §244A). However, Hegel also acknowledges that any philosophy of nature can attain its goals only in cooperation with natural sciences. He emphasizes that "not only must philosophy accord with the experience nature gives rise to; in its *formation* and its *development*, philosophic science presupposes and is conditioned by empirical physics" (*Enc*. 2 §246R). The idea that Hegel first formulated in the 1807 *Phenomenology of Spirit* and reiterated in his Introduction to the Philosophy of Nature was that any viable philosophical theory of knowledge must take into consideration the natural sciences and use their findings as material for "metaphysical" (genuinely philosophical, second-order) reflection, a stance that rejects the anti-naturalism associated with traditional Cartesian epistemology (Westphal 2020, 230–31). It also dismisses the apriorism associated with this epistemology.[8] Hegel advocates for an epistemology grounded in nature, where empirical knowledge is not only possible but also essential, as it forms the basis upon which philosophy constructs its concepts and theories. Moreover, as recent research has convincingly demonstrated, Hegel's holistic ontology is based on an examination of causal forces that is not exclusively philosophical but also includes the results of their natural scientific studies (Ferrini 2007; 2009b). Therefore, the Philosophy of Nature should not be seen solely as a conceptual exercise, especially not an a priori one. Instead, it primarily concerns the analysis of interactive forces and actual causal relationships prevalent in nature, which are captured by these concepts. Hegel seeks to comprehend the natural world as a dynamic whole, making the philosophy of nature a philosophical theory that delves into the holistic conceptual content and the ontological implications thereof. If we were to speak of

[8] Traditional epistemology must be a priori because it must first establish the possibility of empirical knowledge in order to justify it.

"deduction" of concepts and principles in the context of Hegel's Philosophy of Nature, it would be in the Kantian sense, for whom to "deduce" means to account for and to justify (*Enc.* 1 *GW* 20 §88). This becomes one of the principal tasks of Hegel's philosophical examination of nature.

Hegel is acutely aware that the adequacy of any conceptual explanation can only be accessed within the actual context of its possible application, rather than in hypothetical or desired scenarios. This fundamental point is vividly illustrated in his Philosophy of Nature. Consequently, it is incorrect to label Hegel as an a priori rationalist, and the assertion of apriorism in his philosophy of nature (and his entire system) lacks a solid foundation within Hegel's systematic framework. Moreover, there are at least two logistical problems with the aprioristic reading of Hegel's Philosophy of Nature: one is conceptual, and the other pertains to content. First, formal logical deduction does not allow for the derivation of specific forms from more general ones. And yet Hegel's philosophical analysis of nature presents precisely this progression. Second, if the Philosophy of Nature were merely an instantiation of the formal logical concepts "deduced" in Logic, it would be hard to explain how Hegel avoids falling into the "schematizing formalism" that he criticizes in Schelling. In fact, what permits Hegel to escape such formalism is his approach of commencing his analysis with natural phenomena themselves and – through a critical examination of these phenomena – demonstrating that they exhibit the conceptual principles revealed in Logic.

Hegel's philosophy of nature is a work of *philosophy*, similar to Aristotle's *Metaphysics* or Kant's *Metaphysical Foundations of Natural Science*, and, as mentioned before, as such is primarily concerned with the conceptual organization of nature. This distinguishes it from natural science, which presents empirical findings and mathematical analyses, and the philosophy of science, which focuses on scientific inquiry, seeking to understand it from a philosophical perspective, as illustrated by thinkers such as Popper, Kuhn, and Lakatos.

What Hegel offers is a metaphysical (philosophical) account of the conceptual structure of nature itself; not how it is represented in scientific models but rather what nature itself ultimately *is*. He seeks to uncover the very essence and underlying principles that constitute the fabric of nature, going beyond the boundaries of empirical data and scientific theories.

## 4.3 Hegel's Account of Nature

My aim in this and the following sections is to address a systematic challenge mentioned earlier and to show that the commonly held assertion

regarding Hegel's "'idea-ization' of nature" is far from accurate. Hegel's conception of systematicity not only clashes with but also necessitates the rejection of the view of his philosophy as a metaphysical theory of Idea, one that disregards the facticity of the given world and subsumes all otherness and finitude into thought. In my defense of this viewpoint, I strive to elucidate the account of Nature that arises from Hegel's Philosophy of Nature. I explore how Hegel conceives of Nature in its relationship to the Idea and delve into his comprehension of Nature's development. During this exploration, I draw attention to two passages – one from the Philosophy of Nature and another from the *Science of Logic* – that, in my estimation, have been underappreciated in existing literature, or at the very least have not received the attention they rightly deserve.

The first passage that originates from section B, "The Notion of Nature," in the Philosophy of Nature opens with the following statement: "Nature has presented itself as the Idea in the form of *otherness*. Since therefore the Idea is the negative of itself, or is *external to itself*, Nature is not merely external in relation to this Idea . . . ; the truth is rather that externality constitutes the specific character in which Nature, as Nature, exists" (*Enc*. 2 §247).

From this paragraph we discern that Nature (1) is the "otherness" of the Idea; (2) "is external in relation to this Idea"; but (3) this externality possesses a distinct and specific character, which substantiates the existence of nature as nature. Before delving further into this discussion, it is crucial to grasp the meaning of "Nature, as Nature, exists." In a preceding paragraph, Hegel criticizes both practical and theoretical approaches to Nature as one-sided. In their understanding of Nature, the former imposes the criteria of human pragmatic practicality while the latter relies solely on its sensory perception and conceptualization. Hegel unequivocally asserts that our true objective in approaching Nature is to know how it truly *is*. He articulates:

> We want to know the Nature that really is, not something that is not. But instead of leaving Nature as she is, and taking her as she is in truth, instead of simply perceiving her, we make her into something quite different. In thinking things, we transform them into something universal; but things are singular and the Lion as Such does not exist. We give them the form of something subjective, of something produced by us and belonging to us in our specifically human character: for natural objects do not think, and are not presentations of thoughts. (*Enc*. 2 §246A)

It is evident that when Hegel refers to Nature, he is referring to a given nature in its genuine existence. Importantly, he does not envision of this given Nature as a product of thought, nor does he equate thought with

Nature. According to Hegel, Nature stands independently as a given reality and is not a "creation" (or any kind of "product") of the (logical) Idea. There is a radical *nonidentity* of the Idea (thought) and Nature, which, in fact, constitutes the *otherness* of Nature in relation to the Idea. Hegel commences his Philosophy of Nature with this notion of the fundamental nonidentity of the Idea and Nature, holding that the two have no commonality and do not even bear any resemblance to one another. Furthermore, Hegel contends that only by conceiving the Idea in this way can Nature be properly understood philosophically and in a sound manner.

Up to this point, the primary focus has been on how Nature is conceived in its relationship to the Idea within the Philosophy of Nature. Now, let us turn our attention to the transition to Nature that Hegel introduces in the concluding pages of the *Science of Logic*. Indeed, if we seek to provide an accurate and comprehensive account of Nature, it is imperative that we approach it systematically.

In the closing paragraph of the *Science of Logic*, where Hegel delineates the transition of the Idea into Nature, he states: "The transition is to be grasped, therefore, in the sense that the idea *freely discharges* [*frei enläßt*] itself, absolutely certain of itself and internally at rest" (*SL* 753/*GW* 12: 253).

Illuminating this transition in his *Encyclopaedia* Logic, Hegel affirms that the Idea "*resolves to release* freely *from itself* [frei *aus sich zu entlassen*] the moment of its particularity or the first determining and otherness, the *immediate idea*, as its *reflection* [*Widerschein*], itself as *Nature*" (*Enc.* §244).

From a systematic viewpoint, Nature is the Idea in its external manifestation. This assertion has often been interpreted to mean that the Idea "produces" or gives rise to Nature, which aligns with a metaphysically idealistic reading positing that reality is thought-like or, at the very least, a derivative product of thought (or the Idea). I find this interpretation problematic and would suggest an alternative reading: The relationship between the Idea and Nature can be described in terms of determination. In pursuit of its own determination, the Idea negates itself as something "other" and external to itself. The resultant determination, which is natural reality itself, stands apart from the conceptual development of the (logical) Idea, as something that is "other" than the Idea itself. Both natural reality and the Idea exist as external to each other, and this is what Hegel appears to have in mind when characterizing Nature as the externality and otherness of the Idea (*Enc.* 2 §247). Space, time, and other natural categories that Hegel considers in his Philosophy of Nature are simply *determinations* of the Idea in the sense described earlier. The movement from the Idea to Nature and subsequently to Spirit is not a process akin to

divine creation – as Findlay, Verene, and some other scholars believe (Verene 1998, 220) – or a mere "process of becoming" (*ein Gewordensein*). Instead, it is properly considered a "transition" (*Übergang*), similar to those found in Hegel's Logic and driven by dialectics. This transition should be seen as an essential "moment" within the dynamics of the system. From a systematic viewpoint, this passage to Nature is an absolute liberation – the "free release" of the Idea into its own externality in the form of "otherness." However, it is crucial not to misconstrue this as implying that Nature depends on the Idea or any other cognitive content for its existence. Instead, Nature (the natural reality) is a freely emerging entity, existing independently of any mind or thought. As an autonomous and self-sufficient entity, it operates according to its own laws, distinct from the laws of logic. This distinction becomes apparent even in the initial categories of the philosophy of nature: Space and time are determinations that are markedly different from the rational principles of thought that constitute the content of the Idea. While historically, the laws governing nature were often understood to be ontologically distinct from the material they govern (Halper 1998, 44–45), Hegel contends that these laws are inherent within nature itself. This is, I suggest, what Hegel means when he declares that "the Idea is present in each grade or level of Nature itself" (*Enc.* 2 §247A, trans. modified). The Philosophy of Nature aims to demonstrate that rational principles are not external to Nature but are somehow embedded within it. Only by recognizing these laws as intrinsic to Nature can we justify regarding them as the laws of Nature.

## 4.4 Making Sense of Hegel's Anti-evolutionism

In the Philosophy of Nature, Hegel offers a comprehensive and intricate account of the natural world, presented as a series of stages arranged in a sequenced manner. The three main sections – "Mechanics," "Physics," and "Organics" – represent the key phases through which nature undergoes a gradual progression, moving from simple and still contingent phenomena typical of inorganic nature to highly developed organisms characterized by increasing degrees of self-determination, which are distinctive features of organic life. Each of these three main stages encompasses a variety of natural phenomena, and all these diverse elements within each stage are bounded (or united) by certain central characteristics. Hegel contends that a true understanding of the individual components can only be achieved when they are considered in relation to the whole. Consequently, while each of the three divisions in the Philosophy of Nature serves a specific and significant role, they also function within an

integrated system. Therefore, only when considered together, in their systematic unity, can these stages (including their substages) provide us with a comprehensive depiction of the natural world "that really is," allowing us to recognize that this world is more than just the sum of its individual parts and forces (mechanical, physical, chemical, etc.) functioning in isolation.

What Hegel seeks to demonstrate is how all the various parts, forces, and natural phenomena interrelate and gradually progress toward what constitutes the *telos* of nature. Importantly, this *telos* is not something external to nature that exists beyond it and necessitates external intervention. Instead, nature itself is inherently perfect and capable of fulfilling its own purpose. Thus, in Hegel's view, the teleology of nature coincides with the idea of development in nature, illustrating an internal drive toward self-realization and fulfillment.

In this philosophical exploration, it is essential to discern, in their singular and immediate manifestations, the universal and complex whole. Hence, Hegel commences his analysis of nature by examining the most abstract forms of objectivity (space) and subjectivity (time) and then progresses toward the examination of the most complete and complex natural forms, such as the structure of organisms, assimilation, and the concept of genus described in organic life. It is impossible to delve into all the intricate details of Hegel's account of the natural world here. Instead, I limit my discussion to the question of how Hegel understands the development taking place in nature. This issue has been the subject of ongoing debate among scholars, and with good reason. According to Hegel, the development of nature is a complex and contentious process, not solely because contradiction drives this development but also because what undergoes differentiation remains preserved and reproduced throughout this developmental process. There are two principal ways in which the progression of nature is conceived: evolution and emanation.

Hegel describes evolution as a "gradual alteration" that moves from the "imperfect and formless" toward more intricate natural objects and organisms. Acknowledging that this theory has its origins in other conceptions of *Naturphilosophie*,[9] he points out that it "does not really explain anything at all" (*Enc.* 2 §249R). In contrast, the concept of emanation, which,

[9] Indeed, even before the emergence of Charles Darwin and his groundbreaking theory of evolution by natural selection, there existed a longstanding tradition that put forth theories regarding natural and biological evolutionary processes. Claims of this nature were already at the core of Empedocles' philosophical thinking.

according to Hegel, originates "from the oriental world," portrays development as a regression that involves the "degradation of being, starting with the perfect being, the absolute totality, God" and ending "with the absence of all form" (*Enc.* 2 §249R). Hegel clearly favors emanation because it sets the most complete and perfect standard for explaining the lower forms. This aligns more closely with the principle of dialectics, which is driven by the immanence of the whole (the Concept) within its individual moments. Nevertheless, he regards both approaches – evolution and emanation – as "one-sided and superficial." However, he seems to recognize that both convey something essential about development: the multidimensionality of its temporality. He recognizes that in its development "the point proceeds towards a place which is its future" but "this is the truth of time, that the goal is not the future but the past" (*Enc.* 2 §261A). In other words, the moment of evolution captures the necessity of the process, while the moment of emanation conveys its purposefulness or *telos*. Without a determinate goal, there can be no concept of development. Despite acknowledging some positive aspects of evolutionary thinking about development in nature and the evolutionary impulse within his own system, Hegel rejects the theories of evolution known to him.[10] In his view, evolution falls into the genetic fallacy by seeking the explanation of what presently exists in past occurrences. However, the most crucial point he makes is that neither of these two approaches to the diversity of nature is sufficient. They merely list various stages in a predetermined order without revealing the necessary relationships between them. Such an approach does not render the relationship between stages intelligible or provide an explanation for qualitative changes. Hegel contends that this relationship can only be explained in terms of the whole development of the Concept itself.

In *Enc.* 2 §249, he unequivocally articulates his perspective:

> Nature is to be regarded as a *system of stages*, one arising necessarily from the other and being the proximate truth of the stage from which it results: but it is not generated *naturally* out of the other but only in the inner Idea which constitutes the ground of Nature. *Metamorphosis* pertains only to the Notion as such, since only *its* alteration is development.

In his Philosophy of Nature and several subsequent texts, Hegel consistently rejects theories that explain the natural process in terms of the progression where lower organisms give rise to higher developmental

[10] The passages in which Hegel rejects the doctrine of historical evolution in the biological realm are well known and well recorded: *Enc.* §249A, §339A2.

species. So, what is Hegel's positive account of the development of nature? Indeed, how should we read his claim that "nature is to be regarded as a *system of stages*"? Does he propose a reductive account of nature, in which the system is understood as an aggregative totality, as some contemporary scholars tend to interpret it?

Upon closer examination, it becomes evident that Hegel's philosophy of nature is neither reductive nor reductionist in nature.[11] While it may appear that Hegel employs a somewhat "reductive" methodology, he does so with the aim of exposing the limitations of reductionist accounts. His goal is to accurately identify and explain nature in all its systematic complexity, which stands in contrast to a mere aggregative perspective (Westphal 2020).

The account of nature that Hegel presents in his Philosophy of Nature aligns with what is now discussed in terms of "emergentism." This concept has its roots in *Naturphilosophie*, and it represents the idea that the behavior of a natural system or organism results from both its structural organization and the material components it comprises. While the material sets certain limits on how a physical system can behave, the proper organization enables physical systems to perform functions that transcend the physical capacities of their constituent matter.[12] It is noteworthy that the initial principles of emergentism, originally formulated by reductionist philosophers, were harnessed in the context of *Naturphilosophie* to support anti-reductionist theories. *Naturphilosophie* aimed to explain various biological and human phenomena by organizing matter into systematic structures, establishing a hierarchy of organization levels, with each level serving as the foundation for the next. Schelling's *Naturphilosophie* largely exemplifies this approach.

In contrast, Hegel's Philosophy of Nature tackles a fundamental philosophical question: If nature and the natural phenomena he examines are indeed real, then how are they and our cognition of them possible? Hegel's philosophical task goes beyond discerning what distinguishes each specific level and how it gives rise to the emergence of its successor. He focuses on determining how and to what extent we are justified in employing various concepts and principles in our cognition of natural phenomena (*Enc*. 2 §252A). This underpins Hegel's own *emergentist* agenda, which differs substantially from the one proposed by *Naturphilosophie*. Hegel's version

[11] For an enlightening and well-argued discussion of Hegel's nonreductionist position concerning natural organisms, see Kabeshkin 2021, 486–90.

[12] For a very accessible and concise explanation of emergentism, see Westphal 2006, 251.

of emergentism aims to demonstrate *why* a particular set of concepts and principles is sufficient for comprehending natural phenomena at a specific level of complexity and *how* these concepts and principles logically necessitate the emergence of the succeeding level. This "system of stages" is not propelled by external factors such as divine command or preordination; instead, it operates internally and *metalogically*, driven by its own inherent logic and principles.

This emergentist account of nature allows Hegel to avoid both pre-Kantian eliminative materialism and Descartes' (substance) dualism. Starting with the empirical condition of particularity or multiplicity and abstracting the essence of development from these conditions (as in Aristotle) can undermine the internal consistency of a developmental model. Hegel is unquestionably a monist, and as a monistic ontologist with a developmental perspective, he demonstrates continuity through the logical structure of his system, unfolding through Idea, Nature, and Spirit. This continuity should not be misconstrued as a complete and finalized account of the entire world. After all, Hegel's *Encyclopaedia* is not describing the generation of the universe. What is crucial about this continuity is that it unfolds from within the system itself, avoiding the pitfall of being an empty formalism where a fixed template, even if genetic, is imposed upon phenomena. This architectonic model also sheds light on how Hegel perceives the relationship between Nature and Spirit, a topic beyond the scope of this chapter.

## 4.5 Concluding Remarks

To summarize, I would like to offer some reflections on the enduring relevance and significance of a philosophical examination of nature by Hegel. In my view, which in general aligns with the position argued by Christian Martin, the lasting value of Hegel's Philosophy of Nature lies in its presentation of a philosophical argument that addresses the insufficiency of both empirical methods employed in natural science and determinations based on human instrumental or pragmatic criteria in fully grasping the truth of nature (Martin 2022). Faced with the limitations of these modes of thinking and their production of an incomplete image of nature, Hegel also cautions against abandoning the pursuit of a rational-philosophical comprehension of nature in favor of adopting mystical, religious, or solely aesthetic forms of insight (Furlotte 2018, 5).

The success or failure of Hegel's own project in addressing the identified issues can be a matter of interpretation and the criteria utilized. However, reading it in terms of emergentism may offer a productive perspective.

Emergentist theories appear to be genuinely philosophical and, therefore, align with the internal criteria Hegel outlined for a philosophy of nature. When nature is viewed solely through the lens of empirical sciences, it does not inherently generate meaning or interpretations itself. This is what Hegel referred to as the "impotence of nature" (*Ohnmacht der Natur*). Quantitative aggregation alone cannot account for qualitative shifts that produce rationally significant phenomena such as "life" or "consciousness" from inert matter. It is the standpoint of rationality that presupposes the objective value of these distinctions.

In this sense, the defense of a philosophy of nature seems to find support only in idealism, which affirms the primacy of meaning over the sensibly appearing manifold. This idealism is inherently in tension with what Hegel calls "crude empiricism," which assumes that nature's unity is purely an empirical matter, and that empiricism holds ultimate authority over the intelligibility of what is real. Hegel's idealist approach to philosophy of nature rebels against such arguments. However, it would be incorrect to understand Hegel's idealism as inherently "anti-naturalistic." His account of nature is not anti-realistic either. He not only affirms the reality of nature but also views it as an autonomous entity governed by its own internal laws and principles. While the "logic of the system" guides its progression through the Idea, Nature, and then Spirit, it would be a mistake to interpret Nature in Hegel's philosophy as an "incarnation" of the Idea, even when viewed through the lens of this "logic" where Nature is introduced as the "externality" of the Idea. What this "logic of the system" captures is not the development of reality itself but rather the movement of thought, "the movement which is cognition" (*PS* 462/*GW* 9: 429). When taken together, the progression of the system through different stages tells the story of this movement. This chapter aimed to illustrate these points.

CHAPTER 5

# *The Logic of Nature*
## *Nature as the "Idea in the Form of Otherness"*

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Given that the Philosophy of Nature constitutes the second main division of Hegel's *Encyclopaedia of the Philosophical Sciences* in its three editions (1817, 1827, 1830), we can easily take this book, and the definitive systematic structure it contains, as the first and most obvious place to start when addressing the question of the systematic placement of nature in Hegel's philosophy. This, however, can be only a general starting point. For what the second division of the *Encyclopaedia* investigates under the title of "nature" is a complex array of topics that includes the material world of nature, our human theoretical and cognitive attitudes toward nature, and our practical and pragmatic relationship to it. Indeed, as the thematic object of the "philosophy of nature," nature is from the outset a complex object. Now, precisely because of this complexity, nature is present in other systematic spheres of Hegel's system as well and is not confined to its second division. In order to address this more pervasive presence of nature within the system, then, we may, as it is usually done, rightly qualify it, first, as "logical" nature (e.g., organic "life" as stage of "Objectivity" in the Logic); we may want to repeat the longstanding Aristotelian distinction between "first" and "second" nature (to name just one occurrence, the presence of natural determinations within the "family" in "ethical life" within the philosophy of objective spirit); and we may resort to calling certain instances of the concept of nature "anticipations" of what is still to come and other instances "returns" of what has been dialectically *aufgehoben*. However, this way of sorting out the recurrence of (the concept of) nature at different stages of the development of the system, while certainly correct, does not address the deeper question that such recurrence and pervasiveness of nature poses. It is, in fact, the very character of Hegel's philosophical *Encyclopaedia* to require thinking's movement throughout the different systematic spheres to produce necessary "transitions," to stage a development whereby a certain stage or object of thinking obtains from the process that has led to it as its necessary

result.[1] At issue, then, is not so much to sort out the different occurrences of nature across the spheres of Hegel's philosophy but rather to account for the systematic logic that guides the unfolding of the concept of nature in this way, that is, to account for the inner logic that grounds the necessity for nature to appear as the second division of the system of philosophy *and also*, at the same time, to be present at crucial junctures in the first and the third division, namely, in the Logic and the Philosophy of Spirit.

This, then, is the question that I set out to investigate: What is the "logic of nature," that is, the internal, specific logic that guides the unfolding of the concept of nature within the second division of the system but also accounts for nature's broader pervasiveness within Hegel's philosophy? This question immediately prompts another one: How is the logic of nature related to the dialectic-speculative pure logic that occupies the first division of the system? The perspective of the logic of nature constitutes the framework within which I address the question concerning the systematic relation connecting the pure determinations of thinking presented by the Logic, nature as specific object of the Philosophy of Nature, and spirit in its emerging from nature yet caught in a development that is still bounded by nature.

What distinguishes Hegel's *Encyclopaedia* from traditional philosophical and nonphilosophical treatises of the same genre is, first and foremost, the immanent dynamic movement that engages thinking throughout its different spheres. Accordingly, these spheres are not static disciplinary divisions but organic parts of the same dialectical development. This means that the points of juncture – the "transitions" or *Übergänge* – that connect and properly produce successive spheres leading from one to the next have a peculiar significance for the constitution of the whole since they are the dynamic places in which the new thematic "object" arises from the preceding movement. Importantly, transitions are structured according to the dialectic-speculative logic immanently governing the development of Hegel's philosophy. In this way, then, Nature arises out of the Logic at its conclusive point;[2] while Spirit arises out of the sphere of Nature once its development is exhausted. On the basis of this sketch of the overall movement of Hegel's philosophy, in a first part of this chapter I give a brief account of the place that Nature occupies in Hegel's *Encyclopaedia* in

[1] This is its proper systematic and genetic "deduction."

[2] Henceforth I use the capitalized "Nature" (and Spirit) to indicate the systematic second sphere of the system (the Philosophy of Nature) and "nature" to indicate the thematic and material object that is the world of nature.

order to address, second, the famous transition from the "absolute idea" of the Logic to Nature. There is a sense in which this movement can be described as the logical idea *becoming* itself nature as its opposite and other or as the idea *yielding to* nature as its opposite and other. Indeed, in this transition, nature is famously defined as the "idea in the form of otherness" (*Enc.* §247). At stake here is the connection between the meaning of nature's "otherness" and the systematic "transition" achieved by means of this otherness. What interests me herein is the difference between the logical reality of the idea and the natural reality achieved in the next sphere. The third step of my argument is dedicated to the analysis of the *specific* logic of nature, which Hegel presents programmatically in *Encyclopaedia* §247–51. Herein, the difference between the pure logic of the first systematic division and the logic of nature comes to the fore in a thematic way. The latter considers nature's specificity as the "other" or "otherness" of the logical idea – the logical idea "in the form of otherness." The chapter concludes with a brief discussion of the relationship between nature and spirit framed, more pointedly, in terms of the "otherness" that nature embodies. At issue is the way in which the logic of nature necessarily leads beyond nature but so as to maintain nature as the material basis of spirit's own specific development, that is, as the enduring basis of freedom's process of actualization. In fact, this is true despite – or, indeed, dialectically, on the basis of – Hegel's description of the transition from Nature to Spirit as the movement of nature's own vanishing in spirit (*Enc.* §381).

## 5.1 Hegel's *Encyclopaedia* and the Philosophy of Nature

In the Nuremberg years (1808–16), Hegel's multiple drafts of a *Philosophical Encyclopaedia* or "propaedeutic" for use in his classes aim, for the first time, at presenting a reflection on the general overall structure of the whole of philosophy itself. At this time, Hegel further investigates the separation between nonphilosophical consciousness and the speculative standpoint – an issue that is already explored in the *Phenomenology of Spirit* (1807). In this context, Hegel proposes a conception of the internal division of the philosophical science which is thought now as an *encyclopedic* division. As Hegel makes clear in his 1812 *Privatgutachten* to Niethammer, the whole of philosophy encyclopedically structured – or the "general content of philosophy" – comprises three "main sciences," namely, "1. the logic, 2. the philosophy of nature, and 3. the philosophy of spirit." All other sciences, which are necessarily "nonphilosophical" (for otherwise they would be reducible to those three disciplines), are already

included within the philosophical sciences with regard to their "beginnings" and first principles. In a philosophical encyclopedia, Hegel maintains, they should be considered in these beginnings only (and not, for example, in their detailed empirical developments: MM 4, 407f.). The logic is the only "pure science" or the science of the pure essence considered as simple and in itself, while the philosophy of nature and spirit are "applied sciences" that have as their object the pure essence respectively in its "alienation" (or movement in otherness) and in the return to itself from this alienation. This disciplinary partition, already latently present in the Jena system drafts, is now explicitly an encyclopedic division and, most importantly, is brought back to the dynamic of an inner, necessary development (the pure essence in itself, in its alienation, in the overcoming of its alienation). Significantly, by thematizing the movement of the idea's alienation, or becoming other, the philosophy of nature sets the tone for the "applied" or "real" philosophical disciplines which, circularly or rather systematically, ultimately aim at overcoming the idea's alienation and yet at preserving its real embodiment in the natural and spiritual world. Moreover, the fact that the second encyclopedic division is concerned with the idea's "otherness" or, as Hegel also puts it, with the "opposite of the concept" which is to be "converted into the concept" for it to be the topic of a science of nature, constitutes the peculiar difficulty in the teaching of the philosophy of nature in the gymnasium (MM 4, 408).

Since "the whole of the science is the presentation of the idea, its *partition* (*Einteilung*) can be first conceived only from the idea" (*HEnc.* §11; *Enc.* §18). Now, "the idea is the self-identical reason that, in order to be for itself, sets itself in front of itself (*sich gegenüberstellt*) and is an other to itself, but then in this other it is identical to itself" (*HEnc.* §11). Thereby Hegel concisely renders the necessary unfolding of the partition of the *Encyclopaedia* through the main division of the Logic, the Philosophy of Nature, and the Philosophy of Spirit. The "idea" as self-identical reason is the protagonist of this partition. In order to be what it is in a self-conscious, actualized way (i.e., to be "for itself"), reason reflectively sets itself against itself becoming the "other of itself" in an act of self-alienation. This is nature. In this otherness, however, reason ultimately recognizes itself and is thereby truly free in the sense of being-at-home, reconciled in its otherness. Spirit finds itself in nature and is finally at home within it. The Logic as the first, foundational sphere of the system gives an account of reason considered "in and for itself" (*Enc.* §18) in its pure structures, that is, it offers an account of "thinking" as such or of the "idea" in the complete development of its pure forms. But the Logic also

gives an account of the real examined in its internal logical distinctions, that is, it considers that which distinguishes, logically or formally, *Realität* from *Dasein*, *Existenz* from *Erscheinung* and *Wirklichkeit*, and examines the inner logical articulation of *Objektivität*. The apparent separation of reason from its actuality – reason's "otherness" (*Anderssein*: *Enc*. §18), "alienation," or exteriorization (*Entäußerung*: *Enc*. §18R) and becoming other, as Hegel intimates already in the Nürnberg *Encyclopaedia* – is the topic of the Philosophy of Nature. Herein we find Hegel's dialectic-speculative transformation of metaphysical cosmology but also an account of the philosophical cognition of nature conducted in a close confrontation with the natural sciences of the time and with past philosophical views of nature. Finally, the process of reason's "reconciliation" with actuality, namely, the reconciliation of "reason that exists" and "self-conscious reason," or the idea's "return to itself from its otherness" (*Enc*. §18), takes place in the development of the Philosophy of Spirit.

With regard to the encyclopedic partition outlined earlier, it is the systematic logic of philosophical thinking that prescribes the fundamental qualification of Nature as the sphere of "otherness," as the movement of "becoming other," of "alienation" and "externalization" (*Entäußerung*). Importantly, this movement takes place in the intermediary sphere of the system, thereby placing Nature as a dialectical "in-between," that is, as the movement taking place between pure logical thinking and the emergence and actualization of spirit. Now, the position of the in-between, quite generally, denotes for Hegel the sphere of negativity, that is, the strictly "dialectical" moment of a process or the "negatively rational (*negativ-vernünftige*)" side of it (*Enc*. §79). This is the moment in which, formally, the "transition into the opposite" takes place (*Enc*. §81). But this step also entails the movement of mediation, and, methodologically, it is here that thinking advances by pushing beyond the systematic beginning, setting the conditions for thinking to return circularly and conclusively back to itself.[3] In sum, the characterization of the sphere of Nature as the sphere of otherness emerges, first, as a systematic and topological characterization dictated by the logic of the philosophical encyclopedia or by the logic of thinking's systematic totality. Otherness designates the intermediate phase of thinking's dynamic process. It is not, directly, a descriptive, objective mark of nature in its material reality.

[3] See for this latter, methodological aspect, Nuzzo 2018. The theory of the three syllogisms placed at the very end of the *Encyclopaedia* proposes, conclusively, a set of different permutations of the sequence (*Enc*. §§574–77; Nuzzo 2004).

## 5.2 From the Logical Idea to Nature: The "Idea in the Form of Otherness"

Hegel stages the movement from the Logic to Nature as the "transition," which, he clarifies, is not properly a transition (or is not a proper transition like the ones that have taken place throughout the Logic) from the "pure idea" to its "determining itself as external idea" (MM 6, 573). In order to address this peculiar movement, a preliminary clarification is necessary. The question concerns the status of the logical forms vis-à-vis the "real" determinations proper of the spheres of nature and spirit – the thematic objects of the *Realphilosophie*. Indeed, this has been the topic of heated debate since the early reception of Hegel's philosophy – a debate that has invested not only the problematic "transition" at hand but also the type of "nature" that results from such a transition.[4]

In agreement with a longstanding tradition, Hegel claims that his dialectic-speculative Logic deals with thinking in its pure formality. However, following this time Kant's idea of transcendental logic as a logic of knowing (and not of mere thinking – *CPR* BXXVI; B79ff./A55ff.), logical form as such is not devoid of content (Nuzzo 2016). Pure thinking's determination is "absolute form," that is, a form able to give itself a determinate content. This implies that the content is not "external" (and externally given) to the form (as Kant's intuition in relation to the concepts) but is self-produced by the form itself. Furthermore, Hegel's logic, following in Kant's aftermath, replaces traditional metaphysics as it critically but also dialectically "sublates" it within itself. With regard to the specific issue that I address here, this means, first, that the relation between logical forms – and the "absolute idea" as the highest form attained by the Logic – and the "real" manifestations of nature and spirit is not simply the relation between the abstract (i.e., lacking content) and the concrete; and it means, second, that the relation between the science of logic and the philosophy of nature is not a simple "application" of an empty logical form to formless and independently given contents. Finally, it means that the Logic is already tasked with taking up metaphysical and epistemological issues concerning nature – first and foremost ontological and cosmological issues concerning the totality of the world but also scientific issues such as the ones concerning classifications in nature, nature's

[4] As I have explored this topic extensively elsewhere (see Nuzzo 2018, chapters 1–3), I limit myself here to two programmatic passages. See Nuzzo 1995 for an account of Trendelenburg's and Schelling's critiques of this transition; and Houlgate 1999 in reference to Schelling.

continuum, and the understanding of living organisms. This accounts for the necessary presence of nature within the Logic – from the Logic of Being (Quantity, for example, where the Kantian cosmological antinomies are addressed; and Measure, in which theories of the continuum in nature are featured) to the Logic of the Concept (where organic life and mechanical and chemical phenomena find their place). But then the obvious question emerges of what properly distinguishes logical from natural and spiritual forms; or, to push the point further, if nature is somehow already present in the Logic, what is the difference between "logical" nature and "real" (or material) nature?[5] What is it that is properly achieved in and by the transition that leads beyond the Logic to Nature? The short answer herein points to the notion of "otherness." As we shall see, somehow the nature that appears in the Logic – or intra-logical nature, as it were – is *not* the other of the idea (MM 6, 265). True otherness can emerge only at the end of the Logic.

In the introduction to the *Science of Logic*, in outlining the relation between his new dialectic-speculative logic and traditional metaphysics on the one hand and Kant's transcendental logic on the other, but also in relation to his own *Phenomenology of Spirit* (1807), Hegel claims that the "content" of the "pure science" is thinking that having been "liberated from the opposition of consciousness" is now "objective thinking" (MM 5, 43). Thinking's objectivity guarantees that the logic does not "lack the matter (*Materie*) of an actual and true cognition; that its content is the absolute true" or, Hegel suggests, "the absolute matter," namely, a matter that is not "external (*ein Äusserliches*) to the form" and is not independently given but is rather self-produced as "absolute form" (MM 5, 44). There is no exteriority binding matter and form, thinking and its objectivity, cognition and its object. Such is the character of logical form-matter both in contrast to phenomenological consciousness and to Kant's idea of transcendental cognition and in contrast to the knowledge of the particular sciences. As a consequence, Hegel defines the Logic as the "system of pure reason, as the realm of pure thinking." In its systematic totality, the sphere of logical thinking is the "realm of truth," which lacking all exteriority and otherness is "truth as it is without veil (*Hülle*), in and for itself." By contrast, then, the determination of thinking's content *as nature* and *as spirit* implies, somehow, an exteriority that is not (yet) present in the Logic as it does not belong to logical "absolute form." Or, to put the point differently, the specification of the content *as nature* is the external,

[5] This issue deserves an exploration of its own. See the literature quoted earlier for further discussion.

additional "veil" that the logical form in its absolute "in and for itself" does not possess. As a somehow equivalent formulation, Hegel proposes the famous image whereby the content of the Logic is "the presentation of god as he is in his eternal essence before the creation of nature and of a finite spirit" (MM 5, 44). The Logic embraces the totality of the universe as the totality of all there is, "before" and independently of its specification in "nature" and "finite spirit." This is the case to the extent that nature's and spirit's being, and being thought, are equivalent to the "eternal essence" or to the totality of the "world" or cosmos, the principle of which, Anaxagoras declares, is *Nous* or thinking in its objectivity. Logical objectivity is thinking's worldliness as considered, logically, "before" its specification in nature and spirit. Thus, in the Logic, nature is not yet there *as nature* although it is certainly there in the ontological and epistemological structures it shares with the infinite essence and the cosmos embraced in its totality by the logical form.

Hegel opens the second main division of the *Science of Logic*, the Subjective Logic or Doctrine of the Concept, with an account of the peculiar ways in which the dialectic-speculative *Begriff* differs, among other positions, from what Kant's transcendental logic takes to be the concepts of the understanding or categories. At stake, once again, is the issue of logical formality (MM 6, 264) and Hegel's insistence on the fact that the dialectic-speculative concept far from being an abstract form lacking content, hence needing a special "deduction" as proof of its "objective validity" or "reality" (as Kant instead claimed it did) is, instead, what is most real or actual and capable of producing its own content. The movement of the concept taking place in the Subjective Logic is its "realization" to idea. In this regard, the concept's "truth" is not "abstract truth" but real and realized truth (MM 263f.). Hegel concedes, however, that in relation to the "other parts of philosophy, namely, the *sciences of nature and spirit*," which are "concrete sciences," the Logic is indeed "the formal science (*die formelle Wissenschaft*)" (MM 264f.). In what then does this difference consist?

Given that the Logic deals with the *Begriff*, which is itself utterly "real," Hegel resorts to describing that difference in terms of degrees of reality. The "concrete sciences" of nature and spirit do attain "a *more real* form (*einer reelleren Form*) of the idea" than the Logic (MM 6, 265, emphasis added). In other words, there is the logical real and the natural and spiritual "more real" – a claim that seems, in fact, only to shift the question. For, it should be asked, in what does that difference in (degree of) reality consist? Hegel's explanation begins by ruling out that the

enhanced "reality" of the concrete sciences of nature and spirit may be their falling back to the appearances that phenomenological consciousness continues to oppose to itself. But he also rules out that it may consist in apprehending a reality that can be grasped by the determinations of reflections and, more generally, by the categories of the finite presented in the Logic of Being and Essence. The reality of the concrete sciences consists, instead, in taking the "concept" as their "*Vorbildner*" or prototype. But, more precisely, their reality can be understood only by regarding their specific object – namely, nature and spirit, respectively – from the height of the "idea" into which the logical concept actualizes itself. For, at this highest and conclusive stage of the Logic the "idea" becomes "the creator of nature (*Schöpferin der Nature*)" passing over into "a form of concrete immediacy" that is the reality of nature. Before this stage, there is no specific difference between the logical real and the natural and spiritual real. The image or representation of the "creation" is appealed to in both passages[6] in order to signal the radical shift and discontinuity – the "transition" or "passing over" (*überschreiten*), as it were – that takes place between the two successive spheres, namely, Logic and Nature despite the reality and conceptuality underlying both. The counterpart of this logical conclusion on the side of the concrete sciences is to hold on to the realized concept as their "inner formative principle (*inneren Bildner*)," that is, as the rational basis on which the specific reality of their respective object successively unfolds (MM 6, 265). As the logical idea can be considered, figuratively, the "creator of nature," the realized concept continues to be the immanent formative and creative force within nature.

In the introduction to the Doctrine of the Concept, Hegel shifts the discussion of the peculiarity of the dialectic-speculative *Begriff* as "absolute form" from its difference from the abstractness and lack of content of traditional views of the logical concept (Kant's in particular) to its relationship to the "concrete sciences" that further articulate the philosophical system. Since the concept is real, what is systematically relevant is not the issue of "deduction" or its "objective reality" as such but its relationship to the forms of nature and spirit. For the concept is "already for itself the truth" (MM 6, 265). It does not need an additional deduction to prove its objectivity. Importantly, Hegel adds that in the case of the logical concept the content is, first, self-produced or "posited by the form itself," and second, and by consequence, is entirely "adequate" to the form. The "pure

[6] It is important to underline that in both cases the image is employed in introductory contexts, not in the immanent development of the logical movement.

truth" embodied in the logical concept is truth in its "pure" form "because the determinations of the content *do not yet have the form of an absolute otherness or of absolute immediacy*" (MM 6, 265, emphasis added). Again, at stake in the Logic is truth "before" its display of the "veil" of externality or otherness, before its transition to concrete immediacy (MM 5, 44). This latter is Nature. It is only herein that the content displays "the form of an absolute otherness." Accordingly, what changes in nature is the relationship between concept and reality, hence the form assumed by truth itself, which is now no longer "pure truth." It is not that in the sphere of nature there is no truth or adequacy of concept and reality. The fact is rather that the relationship of the two sides is shaped differently because of the fundamental externality and otherness that now measure and determine that congruence of concept and reality. This latter (hence truth) takes place *in and through otherness*. This accounts for the "more real" form of the idea encountered in nature.

In sum, this is then the true relationship between the formal science of logic and the concrete sciences of nature and spirit: The former shows how the specific reality of nature obtains from the intra-logical actualization of the concept through a peculiar "transition"; the latter take the "concept" as the immanent "formative force," operating within the full-fledged materiality of nature and spirit. In nature, then, the "idea" displays a "more real form" than in the Logic first because nature obtains from the logical idea as a transition to "concrete immediacy" or immediate being, and second because the development of the sphere of nature adds a specific "external" determination to the inner formative activity of the concept thereby displaying "the form of an absolute otherness" (MM 6, 265) which the pure concept does not confront throughout the logical development.

In his introductory discussion of the dialectic-speculative concept, Hegel offers another important hint as to how to understand the relationship between the reality of logical form and natural and spiritual reality. The immediate reference is to the inadequacy of Kant's account of the concept in terms of "representation" and its being set in contrast with "intuition" – these being forms of subjective "self-conscious spirit" that have no place within the Logic. Hegel explains that "the pure determinations of being, essence, and the concept, do also constitute the basis and the inner, simple sustaining structure (*die Grundlage und das innere einfache Gerüst*) of the forms of spirit" just as they are the inner framework of the forms of nature. The relationship, then, should be put as follows: Spirit "as intuiting spirit" is spirit "in the determination of being." This, however, is a claim belonging not to the science of logic but to the specific

logic of spirit, in which "concrete figures (*konkreten Gestalten*)" are connected to pure logical determinations. Hegel insists that such concrete figures are of no concern to the Logic just as "the concrete forms that the logical determinations assume in nature" are of no concern – such as, in Hegel's example, space and time, and inorganic and organic nature. The intra-logical reality captured by the concept is not the "concrete," that is, specific reality of nature's and spirit's "figures." Thus, while the *Begriff* is present throughout nature and spirit, in the Logic the concept is considered "in and for itself." Correspondingly, viewed from the spheres of nature and spirit, the logical "in and for itself" is the perspective in which the concept is "the basis and the inner sustaining structure" of both – its reality being purely logical. And this is how Hegel puts this point: The concept "in and for itself" "constitutes *both* a stage of nature *as well as* a stage of spirit" (MM 6, 257). There is an ontological neutrality to the logical concept and its reality vis-à-vis the specificity of nature and spirit captured instead by the concreteness of the "figures" of which the concept constitutes the basis. It is precisely its ontological neutrality that makes of the concept the "inner sustaining structure" "*ebesowhol*" of nature "*als [auch]*" of spirit.

So now, on this basis, let us turn to the conclusion of the Logic and the peculiar "transition" to Nature.[7] It is important to underline, first, that this transition takes place – *can* take place – *only at the end* of the Logic. This is the point in which the logical process of determination has exhausted – or has completely fulfilled – its course. This means that no other determination or form can be obtained that is still a *logical* determination, that is, a determination that fulfills the characters proper to the "absolute form" characterizing of logical thinking. Now, among these characters are the utterly *internal* self-production of content and the *intrinsic* congruence of the content's reality to the concept (i.e., the exclusion of externality and otherness). These remain the characters of the absolute idea up to the end. Being at the end, the movement that concludes the Logic cannot produce any *logical* determination that has not already been encountered within the previous development.[8] It follows that the outcome of such a transition, or the outcome of the idea's last action, can only be a *nonlogical*

[7] I have analyzed this conclusion extensively elsewhere (see Nuzzo 2018, chapter 6); here I address only the limited aspect leading to the definition of nature as the otherness of the idea.

[8] The equivalence of the "absolute idea" to "absolute method" is closely related to this consideration. In the last chapter of the Logic there is no new "content" that can properly be obtained (that has not been encountered in the previous development). What is left is a thematization of the "method" through which all logical contents have been obtained up to this point (see Nuzzo 2018, chapter 2).

determination or the opposite of that which characterizes the logical form *as logical*. Thus, the "idea" is "as the negative of itself or *external* to itself" (*Enc*. §247). Now, at this point, "externality" and "otherness" are first and foremost systematic markers of the *nonlogical* "element" produced by the Logic's end. The claim that identifies nature with "the idea in the form of otherness" is the claim that posits nature as the systematic successor of the Logic after its conclusion, that is, after the process of pure thinking has completed the development of all its forms: "*Nature has resulted* (*hat sich [. . .] ergeben*) as the idea in the form of otherness" (*Enc*. §247 – my emphasis). This is what the transition looks like from the other side. From the side of the Logic, Hegel discloses that the "idea" is now "intuition." Not primarily *Begriff* as it has been so far but *Anschauen*. And "the intuiting idea is nature" (*Enc*. §244). In the introduction to the Doctrine of the Concept, Hegel argues against Kant's split that makes (sensible) intuition external to the concept by reclaiming the grasp on reality back to the dialectic-speculative concept and referring intuition to the more concrete figures of subjective spirit (MM 6, 257). At the end of the Logic, though, intuition regains the character of externality with regard to the logical idea, and the intrinsically dialectical formulation that posits nature as the "intuiting idea" embodies the systematic threshold reached at this point. We are both in and out of the Logic – "intuiting idea" is indeed another expression of the idea's "otherness."

Hegel famously claims that the last action of the logical idea is *Entschluss* – the *Schluss* of conclusion and the closing of the circle of the science of logic; the *Entschluss* of the final decision that expresses the idea's highest "liberation" or *Befreiung* (MM 6, 573; Nuzzo 2021). But there is yet another meaning to that *Entschluss*. *Ent-Schluss* is the idea's act of opening up to a dimension that was not there for the logical process, which was consistently maintained closed within the idea, within the self-contained absoluteness of the "in and for itself." Indeed, in the conclusion of the Logic, Hegel underlines how the "idea is *still* logical" since "it is shut up within pure thinking (*in den reinen Gedanken eingeschlossen*)" (MM 6, 572). *Entschluss*, by contrast, is the act of cracking open and breaking away from that "*eingeschlossen.*" It is the act of opening up that closure ushering in the dimension of externality and otherness. *Entschluss* is the act whereby the idea finally unlocks the tight enclosure of the logical sphere, escaping from it, as it were, escaping from the "world of shadows" of the Logic into the world of the concrete bodies that cast those shadows (MM 5, 55; Nuzzo 2018, 99ff.). At this point the "inner sustaining structure" or the "skeleton" (MM 6, 257) that is the fully realized logical concept for the

first time wears its flesh. This is how nature emerges, systematically, as the otherness and externality of the logical idea, as the utter "immediacy of being" (MM 6, 573).

It is only after the systematic break announced by the transition of the idea to nature that "otherness," in addition to being a marker of systematic succession, becomes properly content: Otherness is "the *externality* of space and time absolutely existing for itself without subjectivity" (MM 6, 573) – the first "figures" of nature. Viewing, this time, the transition from the side of the "concept of nature," Hegel establishes a third meaning for the *Anderssein* and *Äusserlichkeit* thereby achieved. Exteriority and otherness do not designate the relative position of nature toward the idea – and toward "its subjective existence, namely, spirit." They constitute rather "the determination in which idea is properly as nature" (*Enc*. §247). Otherness and exteriority are the ontological and epistemological ciphers constitutive of nature; they are the "element" in which the development of the logic of nature takes place and by which it is specifically informed.

With regard to all three meanings of nature's otherness – the systematic meaning, otherness as content determination of the object "nature," and otherness as the "element" of the logic of nature – and in contrast with many usual readings, I want to underscore that *Anderssein* and *Äusserlichkeit* do not represent a regression of the absolute idea in its falling back and down from the heights of the Logic into the alienated immediacy of being, nor are they signs of deficiency and imperfection only awaiting to be eliminated or overcome in spirit, only there in order to "vanish" in spirit (*Enc*. §381, also §376; Schülein 2021, 134). For one thing, they mark the "liberation" of the idea to a truly novel dimension of existence – they express the gesture whereby the logical sphere opens up to a different, necessary dimension of nonlogical existence. For another, as much as nature is "the idea in the form of otherness," the (logical) idea is itself the otherness of nature. In the second systematic sphere, the idea is "otherness" just as nature is; or through the figure of "otherness" the idea and nature are now one. As much as this reciprocity may be resisted on the ground that at stake herein is nature and not spirit, as much as reciprocity may be denied on the ground that there is no awareness in nature of the otherness that it embodies, logically that reciprocity is inscribed in the very notion of *Anderssein* as well as in the systematic succession at stake herein. Thus, the idea is the otherness of nature as much as nature is the otherness of the idea. The recognition of both these sides is important when what is at stake is the question of what remains of nature once spirit comes to the

scene – and comes to dominate the scene.[9] But, most of all, it becomes relevant when an issue is at stake with which we, not Hegel, are dramatically confronted today, namely, the issue of the "end of nature." Perhaps, at this historical juncture, spirit has to recognize what it means for it to be the very other and otherness of nature, and let nature be, set it free as the absolute idea does at the end of the logic – *Entlassen*. In fact, this is a very different act than to posit nature as the other of spirit – an otherness there in order to be sublated and overcome in its otherness.

## 5.3 The "Concept of Nature" and the Logic of Nature

The logic of the encyclopedic system of philosophy is provided by the dialectic-speculative method that Hegel thematizes in the conclusion of the Logic.[10] The logic of the encyclopedic whole, however, is this *logical* method *as it is successively modified* – that is, both specified and expanded – by its interaction with the different "elements" characterizing the thematic objects proper to each sphere, each one being the result of the previous sphere: nature and "otherness" as its "element" being the result of the logical idea's first alienation (*Enc*. §247); spirit and "subjectivity" as its "element" being the result of nature's transition to its "truth," that is, to the "subjectivity of the concept" in which the overcoming of nature's alienation begins (*Enc*. §376). Thus, the logic guiding the development of the sphere of Nature displays two components. The first is provided by the pure logic that reveals the basic, fundamental structures of nature's reality and its forms of cognition. This is the method provided by the Logic as the first sphere of the philosophical system. At stake herein is the actualized *Begriff* (the idea) that, as we have seen, in its pure form and ontological neutrality is the underlying "inner sustaining structure" of both nature and spirit (MM 6, 257). The second component is the *modification* of the pure logical method that arises as the concept now interacts with the specific "element" characterizing nature – as we have seen, the element of "otherness" and "externality" that systematically identify nature as the successor of the logical idea. Such an "element" is the *medium* in which the concept is now specifically considered; it is the "veil" (MM 5, 44), to use Hegel's image, in which that sustaining logical structure receives full-fledged reality. Accordingly, nature is initially the idea in the exteriority of

[9] I touch on this issue only briefly at the end of these considerations. See for this my forthcoming essay "Spirit as the Other to Nature."

[10] Henceforth I take "method" to mean, minimally, the inner "logic" of a process (which is both the process that constitutes the object and its cognition).

its space and time determined "otherness." Furthermore, the "element" of nature in which the logical concept is successively to be considered is constituted by the manifold representations that accompany our cognitive and practical attitudes toward nature.

Let us now look at how Hegel programmatically discloses the necessary modification of the logical method at the beginning of the Philosophy of Nature. Herein at stake is the general introduction of the specific logic that is to guide the immanent development of the sphere of nature up to the emergence of Spirit.

Hegel presents two lines of argument. First, he introduces the idea of nature by addressing the different modalities in which we relate to it – practically and cognitively – as well as the different common, scientific, and philosophical representations that we have of nature. Thereby, the identity between the "intuiting idea" and "nature" that has concluded the previous sphere (*Enc.* §244) is confirmed and fleshed out in a nonlogical, concrete way. Indeed, nature is also *Welt-Anschauung* as it includes the worldviews in which we are always already implicated. Second, Hegel brings the common understanding of nature thereby disclosed to bear on that which, more properly and scientifically, constitutes the "Concept of Nature" that has arisen in the transition from the logical idea (*Enc.* §§247–51). In sum, the Philosophy of Nature begins by showing, first, how the "concept" of nature corresponds to common, concrete, historical "representations" and practices, and second, what is the properly philosophical "concept" that in connection with the specific element of nature, namely, its otherness and externality, is set to guide the development of the new systematic sphere as its specific logic.

While the beginning of the Logic rests on no presupposition at all, both the Philosophy of Nature and the Philosophy of Spirit systematically develop on the basis of presupposed representations of their respective objects. These representations are both common ways of relating to their specific objects and historical notions of them but are also implied by the intra-systematic conceptions yielded by the transition from the previous sphere. From the "practical" attitude that we assume toward nature, which is disclosed by the "finite teleological standpoint" and consists in appropriating natural objects instrumentally for our purposes, we can infer the characters of immediacy, exteriority, and contingency we generally attribute to "nature." In this framework, we are led to the "correct presupposition that nature does not have in itself the absolute final end" (*Enc.* §245). The "theoretical" approach to nature by contrast – the one proper to "physics" and to traditional versions of the "philosophy of nature" – being

a "*conceptual* consideration (*begreifende Betrachtung*)" of nature does not appeal to external determinations of its object as the practical attitude does but aims at a "cognition of the universal" in nature, that is, at nature's laws, genera, and species, which in its turn leads to a view of nature as an "organization" (*Enc*. §246).

While the end of the Logic posits nature as the exteriority and otherness of the idea, the beginning of the Philosophy of Nature confirms this result, underscoring how those formal determinations of exteriority and otherness are implied in man's practical and theoretical attitude toward nature. Hegel's point, however, is to insist that the dialectic-speculative comprehension of nature must overcome the one-sidedness of such commonsense unscientific "presuppositions" and replace them with determinations that arise out of the immanent development of the *concept* of nature (*Enc*. §245). Thus, in contrast to the *practical* attitude toward nature, at stake now is the "method" – the *Betrachtungsweise* – that given by the very "concept" of nature guides the unfolding of nature as a whole (*Enc*. §245); while in contrast to the *theoretical* attitude of "physics" at stake in Hegel's new speculative "philosophy of nature" is the "*conceptual* consideration" (*Enc*. §246) of the universal and necessary development of its object. This aim is achieved by endorsing a method guided by "the proper, immanent necessity" of the concept of its object so that the articulation of the "philosophy of nature" is ultimately the "self-determination of the concept" of nature itself (*Enc*. §246). This twofold claim now specifies, in the case of "nature," the general contention that Hegel presents with regard to the overall method of the *Encyclopaedia*, namely, that its divisions be produced by the "necessity of the concept" (*Enc*. §246). Now at stake is not the pure logical concept but the concept *of nature*, or the concept *that exists in and as nature*.

The "concept" of nature that results from the conclusion of the Logic is now reestablished: "[N]ature is the idea in the form of otherness." With regard to the task of developing this concept in its specific immanent determinations, this definition means not only that nature is exteriority with regard to the idea or with regard to its "subjective existence in spirit." It now means that "exteriority constitutes the very determination in which the idea is nature" (*Enc*. §247). Exteriority is the fundamental feature proper to "nature" as it constitutes the "element" in which the concept develops (its first appearance of which are the conditions of space and time and matter); hence it is one of the chief determinations that modify and expand the logical method presented at the end of the Logic. Accordingly, Hegel claims that immersed "in this exteriority the determinations of the

concept have the appearance (*Schein*) of an *indifferent subsistence* and of the *singularization* (*Vereinzelung*) against each other." The modality in which nature displays its forms of existence (*Dasein*) is "necessity and contingency," not freedom. Herein, the "concept" constitutes the dimension of "interiority" within the "exteriority" that nature itself is (*Enc.* §248). Furthermore, "contradiction" is present in nature specifically as a contradiction in natural *existence*. At the most general level, nature displays the contradiction between the "necessity" and lawfulness of its forms (the ground of which is the concept) and their "contingency" and utter lack of regularity (*Enc.* §250). Importantly, this is a contradiction that nature cannot resolve. It is the "*unaufgelöster Widerspruch*" (*Enc.* §248R) whereby a gap – hence a constitutive otherness – always separates the concept from its natural existence. Herein we encounter nature's distinctive "*Ohnmacht*" or powerlessness (*Enc.* §250R). This is a powerlessness that has its specific "right" in it and constitutes nature's specific truth *as nature* (*Enc.* §250). Ultimately, in its successive modifications through nature's mechanical, physical, organic manifestations, this is the contradiction that leads the philosophy of nature to its end and to its transition to spirit. "Natural death" dialectically entails the idea of the "life" of spirit, namely, "subjectivity," whereby the "transition" to – hence the beginning of – the new sphere of spirit is achieved (*Enc.* §376).

Hegel maintains that nature must be considered "a system of levels," each one obtaining from the previous one in a necessary way so as to find its "truth" in the stage that follows (*Enc.* §249; Wolff 1989). This necessary succession of levels, however, should not be taken ontologically in the sense of a "natural" production, that is, in the sense of Goethe's "metamorphosis" or of an "evolution" in which the whole of nature is seen as the protagonist. Rather, the succession of nature's levels is a *logical* succession, structured by the "idea" as its internal "ground." For it is only the "concept" that can be the subject of a "metamorphosis." Within nature, because of its constitutive exteriority, only the living individual, not nature as a whole, can be considered subject to it – and the subject of it (*Enc.* §249). Accordingly, the method of Hegel's philosophy of nature is not a logic of "evolution" but the logic of the unfolding of its conceptual levels. The reason for this lies in the way in which the development of the logical concept is modified by the exteriority proper of nature's element, that is, by the way in which the determinations of the concept are manifested *in the medium of natural existence*. Thus, in the logic of nature the development of the inner "dialectical concept" does not necessarily correspond to the wealth of its manifold external manifestations (*Enc.* §249R). It follows

that there is evolution (or "metamorphosis") *in nature*; but there is no evolution *of nature*. Herein the movement of nature through its levels differs logically from that of spirit.[11] Indeed, the process and successive modification of nature is not properly *Entwicklung*. This term describes the "development" of the pure logical concept as well as that of spirit's actualization but not the movement of nature as a whole (*Enc*. §249). And yet, although Hegel does not view nature as an evolving totality, he does consider it an organic whole. Nature is "in itself a living whole" (*Enc*. §251).

While the first sphere of the Philosophy of Nature, the Mechanics, addresses the exteriority of nature's spatio-temporal materiality, the second sphere, the Physics, brings to the fore the forms of natural individuality, in order to end, with the Organics, by thematizing the processes of natural "subjectivity" (*Enc*. §252). The movement that articulates its successive levels and gives the inner logic and division of Hegel's philosophy of nature is the movement whereby "the idea *posits* itself as that which it is *in itself*," that is, the movement whereby the idea "from its immediacy and exteriority, which is *death*, goes into itself in order to be first as *living being*, and then to overcome this determination in which it is only life, and to produce itself in the existence of spirit." The latter is now disclosed as the "truth and final end (*Endzweck*) of nature" (*Enc*. §251) – that end which the commonsense practical, teleological attitude toward nature correctly considers external to it (*Enc*. §245).

## 5.4 Spirit as the "Other to Nature"?

I want to conclude with a brief discussion of a suggestion that I outlined earlier in connection with Hegel's presentation of nature as the "idea in the form of otherness."

Hegel contends that Nature is Otherness not only in relation to the logical absolute idea (nature *is* the idea "in the form of otherness") and in relation to spirit's subjectivity (which successively overcomes and appropriates such otherness in its freedom). Nature is Otherness as such in the sense that otherness and externality are the constitutive elements in which nature unfolds its determinations, maintaining the concept as inner ground but constantly betraying it, constantly modifying it through nature's existing exteriority and through the opposition and contradiction this exteriority poses to it. Heretofore I have explored this claim by viewing it from two different perspectives, namely, from the Logic and its

[11] See *Enc*. §380 for an account of the "*Stufen des Geistes*" in the development of the sphere of spirit.

conclusion, and from the beginning of the Philosophy of Nature. However, pushing the notion of nature's Otherness further, I have also suggested that if nature is Otherness – *Anderssein* and *Andersheit* (Henrich 1982) – it must itself have *its own other and otherness*, in other words, something that is, in turn, other *to it*. I hesitate here to say "other for it" because, as mentioned earlier, there is no spiritual subjectivity and awareness and properly no self-consciousness in nature – although, importantly, in the animal living and dying individual nature does in fact reach a form of (proto-)subjectivity (*Enc*. §374; Schülein 2021, 142f.). I maintain, though, that to claim that if nature is otherness, then there must be something that is other *to it*, is fully appropriate and is also sufficient to raise the question of nature's otherness as the question of what it is that is other, this time, *to nature*.[12]

In and as nature, the idea is not the "other to nature." Spirit, on its part, is not the "other to nature" in its resulting from nature. For spirit emerges from nature once nature's otherness has "vanished" or, rather, has begun to vanish. Spirit emerges, in other words, when its proximity to nature is established to the point that spirit relates only to itself in it. At this point, the "alienation" or *Entäusserung* that nature represents as the "complete external objectivity" of the concept, is overcome in the "identity" of spirit coming back to itself "from nature" (*Enc*. §381). What lies ahead for spirit after this beginning is yet another long path of successive mastery and appropriation of its own naturalness, self-alienation, and coming back to itself from self-alienation.[13] But is spirit, at any point, the true other *to nature*? What does the figure of the "other to nature" even mean?

This figure implies, first, that there is something systematically beyond and outside of nature that is different from and irreducible to it, and that warrants nature's independence of this other but also, at the same time, a peculiar position or stance *in relation* to it. It seems that there must be something other to nature in order for Nature to constitute a systematic sphere in its own right. Such otherness (and only it) would in fact deepen the discontinuity that separates nature and the logical idea on the one hand and nature and spirit on the other. As "other to nature," spirit would not find itself and its own identity in nature – or such self-finding would reveal itself as an illusion. For spirit's otherness would remain because it is not up to spirit to overcome it (if anything, it is up to nature to revoke it). This

[12] As a question of otherness as the objective genitive of/to nature.

[13] This is certainly a simplifying way of putting the trajectory of the Philosophy of Spirit. It is not, however, my topic here.

leads to the second meaning of the figure of the "other to nature." To posit something as otherness seems to imply an active perspective and the meaningfulness within an active perspective – that which is other *to something* as declared and framed *by this something*. Accordingly, the "other to nature" implies an active standpoint within the sphere of nature.[14] Indeed, it is nature itself that sanctions what is other *to it*. In this regard, the "other to nature" is construed quite differently than nature's own otherness. It follows that if spirit, in any of its figures, is to be the "other to nature," it is nature that must confer such otherness to spirit. In this perspective, the "other to nature" is something that nature regards as not belonging to itself, as impenetrable in its very being in relation to nature. I see this meaning of the "other to nature" as the counterpart of the claim that Hegel repeatedly establishes at the beginning of the Philosophy of Nature, namely, the claim that nature is a riddle or an "enigma for us," that "we do not understand it."[15] This latter is nature's otherness vis-à-vis spirit as established by spirit. Correspondingly, it is important to acknowledge that *we humans may very well be an enigma to nature* – that *we* are the "other to nature." Construed in parallel to Hegel's general remark concerning the "riddle" of nature, the reverse claim concerning the "enigma" of the human (or the spiritual) in nature's perspective means that nature does not "understand" us humans.

In conclusion, I want to suggest that this claim is worth exploring, particularly in relation to the current global climate and environmental crisis. As much as our practical and cognitive attitudes to nature constitute the entry point to Hegel's Philosophy of Nature, nature's otherness seems to demand not only the possibility of framing nature's existence independently of them but even to view them as the very "other to nature," namely, as something that nature itself resists and rejects and regards as utterly meaningless. This stronger step is necessary, I suggest, *for us* to undertake. To recognize that *we* may be "other to nature" in our attitudes and deeds – to ask: How does nature see us? – is a way to put in perspective the *hubris* (and often the foolishness) inherent in many of our human endeavors within and toward nature. To recognize that *it* may be "other to nature" is a powerfully humbling experience for spirit. And it is also a way to bring to the forefront a crucial element of our human freedom in our action in and impact on the natural world.

[14] I want to insist on this "active" perspective in order to underline that this "otherness" is not posited by spirit or the idea or the philosopher of nature but by Nature itself. The figure of the "other to nature" then implies some kind of agency (subjectivity) on the part of nature.

[15] See all the references quoted in Schülein (2021, 135–36) in relation to the different *Vorlesungen* on the Philosophy of Nature recently published in *GW* 24: 1.

PART II

# *Cosmology, Mechanics, and Physics*

CHAPTER 6

# *Hegel's* Dissertation on the Orbits of the Planets
## *Plato, Kepler, and Newton as Cosmologists*

*Paul Redding*

The area within Hegel's comprehensive encyclopedic system with which he is most readily identified is surely that of Objective Spirit (the second section of part III, the Philosophy of Spirit) – the part corresponding to his *Philosophy of Right* which stands as one of the canonical works of political philosophy in the European tradition. This is consonant with the fact that Hegel is generally understood as a humanist, whose philosophical interests were predominantly oriented around the topics of history, politics, art, and religion. In contrast, the contents of the *Encyclopaedia*'s part II, the Philosophy of Nature, have rarely been treated as having the same importance. Even by those sympathetic to Hegel, this is usually understood as so dependent on the state of empirical science of his time as to have little relevance for the present-day reader. In contrast, critics dismiss it outright as the meddlings of an amateur out of his depth – a rearguard attempt to preserve an earlier philosophico-theological worldview that was being increasingly challenged by the great discoveries of science.

While defenders of Hegel often soften his stance toward scientific explanation by characterizing it as directed more against the promotion of an *exclusively* scientific worldview than science per se, his critics have been by no means restricted to such "hard-liners." Take, for example, William Whewell, the Cambridge academic, polymath, and general advocate of the sciences who Thomas Posch cites as having declared Hegel's account of the solar system as "non-sensical" (Whewell 1849; Posch 2011, 178). Whewell, an Anglican minister, was no "scientistic" critic of religion and would oppose, based on conflicts with Christian doctrine, Darwin's theory of evolution as well as the thesis of the possibility of life existing elsewhere in the universe (Crowe 2016). Moreover, given that Hegel had chosen science's greatest hero, Isaac Newton, as his representative target of attack, it is not surprising that Whewell's criticisms would often be shared by that developing class of specialists whom he had christened "scientists."

While Hegel's social and political philosophy has remained the most prominent focus of interest within those reassessments of his philosophy that have developed over the last fifty years, a degree of sympathetic reception to his philosophy of nature is, nevertheless, still to be found.[1] This is often accompanied by a general interpretation stressing the degree to which Hegel had given up the pretension to a metaphysics of "pure reason" with which Kant had broken – some type of substantive, a priori theoretical knowledge of the world that might be seen as being in *competition* with modern science.[2] Recent examples of such a *metaphysically modest* interpretative attitude extended to Hegel's Philosophy of Nature can be found in the synoptic accounts of Michael Wolff (2020), Sebastian Rand (2017), and Christian Martin (2021).

Wolff, for example, asserts that "one can only understand Hegel's procedure [in relation to the philosophy of nature] appropriately if one conceives it as a modification of Kant's transcendental philosophy" (Wolff 2020, 205), with this attitude manifest in the *Logic* from which the Philosophy of Nature issues, in particular in relation to the status of its central "metaphysical" category of the "absolute idea." This notion, Wolff claims, refers to "nothing other than our own logical, or more precisely: dialectical thinking – our thinking by which we know the contradictory character of the categories" (Wolff 2020, 210–11).[3] As such, modesty at a *metaphysical* level would deflate even the intelligibility of a thinkable transcendent realm beyond empirical reach – the realm of Kant's unknowable "things in themselves" – and a certain scientific realism might now be thought to possibly coexist with Hegel's project.

Similar deflationary elements can be identified in Rand's interpretation of Hegel's philosophy of nature since, as Rand has it, as conceived *philosophically* by Hegel, nature is interpreted not so much *as such* but from a particular point of view – that oriented by the project of the realization of human freedom structuring his philosophy as a whole (Rand 2017). While the idea of nature as construed internally to a goal of practical reason and action has a Kantian ring, Rand stresses that what separates Hegel from Kant is the

[1] For an overview of the recent reception of Hegel's Philosophy of Nature see Ferrini 2012, section I and Houlgate 1998.

[2] Such defenses of course depend on freeing Hegel from those shortcomings of Kant's own *transcendental idealism* of which he had been such an astute critic.

[3] Martin similarly writes that the *Logic* "deals with the thinking of *us thinkers*" which "requires spatial and temporal embodiment." However, for methodological reasons it does so "in abstraction from such embodiment" (Martin 2021, 90–91). This initial abstraction can give the false impression that the *Logic* "treats of a *different kind of thinking* from ours," that of a divine thinker, for example.

different ways in which the concepts freedom and nature are related in their respective philosophies. For Kant, the ethical freedom of a human being is predominantly conceived of as a type of freedom *from* what constitutes him or her *as* a natural being. In contrast, Hegel had acknowledged nature in the broader sense as needing to be included in the realm for which freedom is to be achieved. It is as if the more familiar idea linking the freedom of *any* particular human to that of *all others* becomes now broadened to a picture in which the freedom of humans as a whole is somehow similarly bound up with realms of nature *beyond* them.[4]

Construing Hegel's Philosophy of Nature within the context of such metaphysically modest accounts of Hegel's *Logic* is not the *only* way in which his Philosophy of Nature has sought to be redeemed, with more robustly metaphysical interpretations being pursued by others.[5] Here I do not *argue* for any such metaphysically modest reading in relation to its opponents;[6] I simply adopt it in line with a strategy that, in its very modesty, is likely to make it more able to address the types of concerns typical of Whewell's working scientists, who are likely to be suspicious of *any* substantive claims about the world arrived at in some aprioristic manner rather than empirically.[7]

Nevertheless, I argue that this metaphysically modest interpretation must be compatible with Hegel's endorsement of the ancient model of philosophy and, seemingly paradoxically, with that of its apparent *über*-metaphysician, Plato.[8] Signs of such an engagement can be found in Hegel's much denounced first venture in the Philosophy of Nature, his 1801 *Philosophical Dissertation on the Orbits of the Planets* – an engagement that must be taken more seriously than is often the case among Hegel's defenders. Hegel claimed that Kepler rather than Newton had been able to

[4] Clearly this is a perspective that many might find more appropriate in the face of the present ecological crisis threatening humanity.

[5] For example, on the basis of Hegel's *Logic*, James Kreines (2015) argues for the substantive rationalist metaphysical claims of the objective existence of "reason in the world" independently of human reasoners, linked to a nonempiricist understanding of natural laws.

[6] For my own deflationary "actualist" understanding of Hegel's metaphysical claims see Redding 2021. For a critique of Kreines' notion of "reason in the world," see Redding 2016 and Martin 2021.

[7] From the point of view of Wolff's understanding of Hegel's ultimate "metaphysical" content of the *Logic*, a response to the working scientist's skepticism might start with little more than a request that she reflects on the self-correcting logical processes she shares with her scientific colleagues – effectively, what Wolff's version of Hegel's "absolute idea" might amount to – and to consider whether the *epistemic success* of those processes could be explained in terms of the same causal explanations of the world that those processes have accompanied. This might then open the way for the possibility of a degree of peaceful coexistence between Hegel, or at least some more recent application of his purported approach, and the scientists.

[8] Olivier Depré (1998) stresses this dimension of Hegel's position in 1801.

formulate realistically understood laws of planetary motion based on empirical findings. Regardless of the soundness of Hegel's case here, the criteria to which he appeals would surely speak to the modern scientist. However, it seems equally clear that for Hegel, Kepler's success had been linked to his pursuit of what seems the antithesis of the modern empirical approach, Plato's "music of the spheres" approach to cosmology. It is the undoing of this paradox that is the aim of this chapter.

## 6.1 Hegel's *Dissertation:* A First Simple Defense of Kepler as Empirical Cosmologist

From the skeptic's point of view, no better example of Hegel's ignorance of the modern sciences might be found than that of his *Dissertation*, "On the Orbits of the Planets" (*Diss.*, 163–206), submitted at the University of Jena in 1801 to satisfy the conditions allowing him to teach there.[9] The *Dissertation*, which shows clear connections with central themes of his later Philosophy of Nature, is infamous for Hegel's having adopted and adapted a sequence of seven numbers from Plato's *Timaeus* – 1, 2, 3, 4, 9, 16, 27 (*Diss.*, 193; Plato 1997, 35b) – in an *apparent* attempt to explain the comparative distances of the (then known) seven planets from the sun, a claim that he never really retracted (Ferrini 1999, 213n64). Worse still, it is often said that Hegel was thereby dismissing, on a priori grounds, the possibility that an eighth planet might be discovered, and indeed doing so in the very year in which a minor planet, or asteroid, was found. Were this to be the case, of course, Hegel would be engaging in that very type of aprioristic reasoning to features of the actual world that he appears to deny in the Philosophy of Nature with the claim that "[i]t is not only that philosophy must accord with the experience nature gives rise to; in its formation and in its development, philosophic science presupposes and is conditioned by empirical physics" (*Enc.* 2P, §246, remark).

Various defenders of Hegel have responded to the gross exaggerations found in standard accusations of this *aprioristic* approach to cosmology.[10]

[9] Cinzia Ferrini has summarized some of the negative reception of Hegel's dissertation as including the accusations of: "incongruities, inconsistencies, absurdities, obscurity, external formalism and powers of imagination, crudest empirical ignorance, ridiculous errors and lack of scientific knowledge, ill-grounded a priori logical deduction of empirical reality, introduction of real content hidden within the formalism of the logical movement, the inability of the dialectical method to produce any actual progress at a cognitive level, and so on" (Ferrini 2012, 118).

[10] Among the many textually based refutation of this claim see, for example, Harris 1983, 96; Craig and Hoskin 1992; and Posch 2011.

Hegel, they note, had been commenting on a similarly formulated series of numbers that had been offered by the astronomers Johann Elert Bode and Johann Daniel Titius,[11] because of which Bode had urged astronomers to search for an eighth planet between Mars and Jupiter, as predicted by the series. Hegel had simply suggested that *were* Plato's series to be accepted rather than the Titius–Bode series, then no thesis of a "missing planet" would be required (e.g., Posch 2011, 178). Such defenders also typically point out that the bulk of Hegel's *Dissertation* had been devoted to a topic much more expected of a modern philosopher – a critique of the idea that Newton's laws could be said to *explain* the laws of planetary motion that Kepler had arrived at *empirically*. From this point of view, in his defense of Kepler over Newton, Hegel's strategy, as Cinzia Ferrini has argued, "leaves room for an absolute principle of empirical reality" (Ferrini 1999, 206).[12]

In supporting Kepler, Hegel was, on this reading, supporting an *eminently*, empirically based approach to astronomy. On the basis of his extensive observational data of the movement of Mars accumulated over decades, together with data acquired from his employer in Prague, Tycho Brahe, Kepler had come to propose three laws of planetary motion: A planet orbits its sun in an ellipse that has the sun standing at one of its two foci; next, a line segment from the planet to the sun (its "radius vector") sweeps out equal areas in equal units of time, entailing the planet speed up as it approaches the sun and slow down as it moves away; and finally, the *square* of a planet's orbit is proportional to the *cube* of the length of the shorter diameter of its elliptic orbit.

With his *universal laws* of gravitational attraction, Newton is conventionally taken as having been able to *explain* Kepler's laws because while Kepler's had said something about the behavior of *planets*, Newton's were able to account for the behavior of many other things *besides*. For example, Newton's laws simultaneously explained Galileo's "Law of Fall" for terrestrial objects (that the velocity of a falling objects increases proportionally with the square of time). This type of subsuming generalization is commonly understood as *exemplifying* progress in science. Newton had never denied the advantage of having stood on the shoulders of Kepler, and why should this not have allowed him to *see further*? Beyond mere regional

[11] Titius had advanced the idea in 1766 with Bode taking it up in 1768.

[12] Brigitte Falkenburg also stresses the role played by "regularized empirical observations" in science on Hegel's account. While the phenomena of empirical science for Hegel are "theory-dependent" and not the bare "givens" typically postulated by empiricists (1998, 98), nevertheless, "the empiricist criticism of unobservables such as forces and atoms, was completely in the spirit of Hegel's own *phenomenological* attitude towards *physics* itself (1998, 99).

loyalties (Kepler had come from the area around Stuttgart, Hegel's birthplace, and, like Hegel, had studied at the Tübingen seminary), why should Newton's success be denied? The simplest answer in defense of Hegel here, I suggest, is that in line with the modern scientists' insistence on the role of empirical evidence, Hegel would argue that only Kepler's laws were empirically based while Newton's relied on postulates that themselves could *not* be empirically justified.

There is much to be said in favor of such a stance being taken at the turn of the nineteenth century, as concerns with problems of the *type* of explanations employed by Newton were still extant *within* the generally "scientific" community. Crucially, Hegel argues that Newton's reduction of Kepler's laws involved an unacceptable reliance on infinitesimally small magnitudes (*Diss.*, 177–80, 189–90). Such an appeal to infinitesimals is standardly associated with the framework of differential and integral calculus of which Newton, along with Leibniz, had been a co-developer. In Europe, Newton's mechanics had been developed throughout the eighteenth century with the aid of calculus, but that had *not* been the method employed by Newton himself in *Principia Mathematica* (de Gandt 2014). Nevertheless, both Newton's and Leibniz's calculus-based approaches to mechanics had relied upon the idea of *infinitesimal magnitudes* that Berkeley would later mock as the "ghosts of departed quantities" (Berkeley 1996, 81). According to Berkeley, the physicists were *as much* committed to entities as mysterious as those they condemned in the accounts of the theologians. One did not have to accept Berkeley's rival spiritualistic metaphysics to feel the weight of this critique, and concern about the use of infinitesimals in science still persisted around the turn of the nineteenth century (Boyer 1959, 224). In *The Science of Logic*, Hegel devotes considerable discussion to this problem engaging with books that were "state of the art" at that time.[13]

In fact, the infinitesimal had been just one of a number of worrisome mathematical magnitudes that had come to be employed in science since the seventeenth century. These "impossible numbers" (Nagel 1979) included the number zero, the negative numbers, and the perplexing "imaginary number" "*i*" that when multiplied by itself gave the result of

[13] John Bell has described two French works appearing 1797 – Joseph-Louis Lagrange's *Théorie des fonctions analytique* and Lazare Carnot's *Reflexions sur la Metaphysique du Calcul Infinitesimal* – as "the last efforts of the eighteenth-century mathematicians to demystify infinitesimals and banish the persistent doubts concerning the soundness of the calculus" (Bell 2019, 84). Hegel possessed both works (Mense 1993, 682 and 685) and employs them in *The Science of Logic* in discussing the problem of infinitesimals (*SL*, 204–34).

$-1$. These magnitudes had been introduced into the sciences as a consequence of the adoption of algebra from the late sixteenth century and had been shown to be indispensable for the solution of the types of equations the emerging sciences employed, but pragmatic success alone did not satisfy critics who often pointed to the apparent absurdities involved in their use (Martinez 2005). Kant had addressed the problem of negative numbers in a precritical essay in 1763 (*CNM*) and their problematic status is said to have been particularly live around the turn of the nineteenth century (Martinez 2005, 46) when Hegel was writing his *Dissertation*.

As with infinitesimals, justification for such magnitudes could not, of course, be simply answered in empiricist terms, but neither could they be justified in terms of the sorts of criteria that had been inherited from Greek mathematics. The "axiomatic method" in which theorems are deduced from axioms and definitions had provided the main model of justification found in Greek geometry and the Greeks had neither a well-developed system of algebra nor the zero or negative numbers that would be required for such algebra. Simple justification by the success enabled by their use was really all that was left, but many at the time would have agreed, as many would still agree, with Hegel's declaration in the *Dissertation* that a principle must not be evaluated simply "on the basis of its use and consequences" (*Diss.*, 177). One might afford these mysterious entities some role in the prediction of phenomena but why extend this to belief in the *reality* of those structures described in the theories that employed them?

Hegel thus raises the question of the ontological status of mathematical objects within the "coupling of physics and mathematics" and warns against confusing "purely mathematical relations with the physical ones; rashly taking the lines used by geometry to construct demonstrations of its theorems for forces or directions of forces" (*Diss.*, 175). However, this itself was not to *deny* that mathematical entities per se could have an empirical reality, as Hegel insists that Kepler's *ellipses* are examples of exactly this. Kepler's ellipses were, are, *real* figures to be observed over time as carved out by the *actual* movements of the planets in their paths around the sun.[14] Rather, his criticism is directed at Newton's directed line-segments or "*vectors*" to which such elliptical shapes are reduced in his *explanations* of the elliptical orbits because of the role of infinitesimals in this reduction.[15]

[14] This is to ignore those imperfections in orbits caused by the gravitational effects of other planets: so-called perturbations. While Hegel acknowledges that it is a strength of Newton's approach that it is able to account for these, he presumably does not see this as contradicting his main criticism.

[15] I am restricting the scope of Hegel's criticism here to that of the empirical reality of Newton's vectorial analysans. For further dimensions of Hegel's criticism see De Vincentis 1998.

It is the reality of Newton's posited rather than observed centripetal and centrifugal components into which Kepler's curves are resolved, along with the forces defined in terms of them, that are in question here.

Justification for the resolution of a curve into rectilinear components, he points out, is not to be found in pure geometry, which "does not modify the true form of the circle" (*Diss.*, 177). In contrast, the *nonpure* geometry in question is one "that endeavors to subject the circle to calculation and to express numerically the relation of circumference to the radius" and that does so by seeking refuge "in the hypothesis of an infinitely-sided regular polygon" but which "does this, however, in such a way that in the same move it suppresses this very polygon and the straight lines by means of the concepts of the infinite and of last ratio" (*Diss.*, 178). *Two* types of "nonpure" geometry can be recognized as implicit in this passage: ancient and modern.

Hegel was clearly aware that in ancient times, the great mathematician Archimedes had employed a method for estimating the ratio between the circumference and the diameter of a circle (later called the number π).[16] In this "method of exclusion," Archimedes had constructed a regular polygon *inside a circle* such that the polygon's vertices touched the circle's circumference. While the length of an arc of the circle could not be measured, the lengths of the corresponding side of the polygon could be. A similar polygon could now be constructed *outside* the circle such that its sides touched the circumference of the circle. If $P$ denotes the combined lengths of the sides of the inner polygon and $P'$ the combined length of the sides of the outer polygon, it can be seen that the circumference of the circle will be greater than $P$ but less than $P'$. By increasing the number of sides of both polygons the difference between $P$ and $P'$ steadily decreases allowing the circumference of the circle to be estimated with greater and greater accuracy.[17] In *Principia*, Newton would effectively employ the same technique in order to measure the *area* under a curve, but for Hegel there were crucial differences in the ways the Greeks and Newton had employed this mathematical procedure.

Techniques such as that of Archimedes had allowed the Greeks to apply geometry to the world and estimate astronomical distances with great

[16] A German translation from 1798 of Archimedes' works *On the Sphere and Cylinder* and *Measurement of a Circle* was in Hegel's library (Mense 1993, 670–71). This was representative of Hegel's "heavy investment in standard works on the calculus and mechanics" as evidenced by his library (Mense 1993, 670), the publication dates of which seeming to indicate their having been purchased around the time of the dissertation.

[17] Archimedes had achieved a value of π as lying between $3\frac{1}{7}$ and $3\frac{10}{71}$.

accuracy. Archimedes' friend Eratosthenes, for example, made remarkably accurate calculations of the circumference of the earth. But while the Greeks were satisfied with values of π that were *accurate enough* for their purposes, Newton *imagined* this method as being carried *to infinity* such that what had been originally *lines* were ultimately reduced to *points.*[18] Hegel says that with this modern mathematics "conceals this identity of incommensurables with the word 'infinite'" (*Diss.*, 189), alluding to the fact that the Greeks had treated curves and linear magnitudes as *incommensurable* magnitudes – they were *different kinds* of magnitude.[19] Newton, he says, conceals this difference, he "suppresses this very polygon and the straight lines" from which he calculated his areas (*Diss.*, 178). When Hegel refers to "the geometry called higher geometry" that "reduces the plane to the line, and both to the infinitely small, that is, to the point" in this way (*Diss.*, 190), he clearly has in mind the modern "analytic geometry" that had been introduced in the seventeenth century by Rene Descartes and Pierre Fermat and upon which Newton had drawn in his mechanics.

In his *Géométrie* of 1637, Descartes had proposed a type of algebraized geometry by introducing the now familiar "x" and "y" orthogonal coordinates within which geometric figures could be situated. As each point on a two-dimensional figure can be linked to a pair of numbers via the coordinates, such a figure could be represented by an algebraic equation as when, for example, a circle centered on the origin of the coordinates and of radius a units is represented by the equation "$x^2 + y^2 = a^2$." Analytic geometry had quickly caught on because of the great advantages it offered to developing sciences such Newton's. Many, however, were concerned that the use of algebra did not conform to the strict axiomatic method found in ancient – or what would now be called in contrast "synthetic" – geometry.

With the reliance on infinitesimals, Newton's methods were still able to be understood at the end of the eighteenth century as far from being free from the sorts of metaphysical "fictions" that working modern scientists might denounce in Hegel. On the other side of the ledger, Kepler's ellipses were for Hegel *genuinely* empirical objects.[20] Nevertheless, the empirical

[18] The Greeks were in general not positively disposed to the notion of the infinite, as conveyed by Koyré's contrast of the "closed world" of the Greeks to the "infinite universe" of the moderns (Koyré 1957).

[19] The number π was not *proved* to be irrational until the eighteenth century, but the Greeks were very aware of the "incommensurability" between curved and linear numbers, as testified to by the ancient problem of "squaring the circle."

[20] Koyré had stressed Kepler's empiricist attitude in his rejection of Bruno's conception of an infinite universe (Koyré 1957, 58–62).

scientist was only one aspect of Kepler's character. Hegel's somewhat off-handed reference to Plato's number series might well raise concerns despite its being *merely* offered as a hypothetical alternative to an existing "Titius–Bode" law.

## 6.2 The Other Kepler: Kepler as Platonic Cosmologist

Hegel was well aware that Kepler's empirical research coexisted with a commitment to the ancient thesis of the "music of the spheres" as expressed in Plato's *Timaeus*. In a move similar to Hegel's employment of Plato's number series, Kepler, in his *Mysterium Cosmographicum* of 1596, had modeled the solar system by embedding the orbits of the planets within a nested structure made up of the five Platonic solids, each of the solids fitting between the spheres of the orbits of the then known six planets (Caspar 1993, 62–64).[21] Kepler's enthusiasm had persisted, and while the first two of his laws had been published in one of the major works of modern astronomy, his *Astronomica Nova* of 1609, the third law would be published ten years later in *Harmonies Mundi* devoted mostly to the "music of the spheres" thesis (Caspar 1993, part IV, chapter 8).

Kepler thus seems to have still had one foot firmly planted in the ancient "cosmos" that was in the process of being transformed into the modern "universe" (Koyré 1958). Given the relatively informed level of the discussion of contemporary issues that could be found in earlier parts of the *Dissertation*, what could Hegel have been getting at with these allusions to Platonic cosmology? I suggest that while Hegel's defense of Kepler should not be quarantined from these aspects of his approach from which modern science would surely liberate it, neither should it condemn Hegel from the modern point of view. In fact, when Hegel's attitude to the Platonic "musical" cosmology is correctly understood, it reveals fundamental features of Hegel's *logic* that can be seen to complement his nonatomistic empiricism in matters of science. In short, the significance of Plato's cosmology was not so much *cosmo*logical as *logical*. Plato's cosmos gave expression to the logical structure implicit in the pursuit of a modern scientific cosmology, as Hegel understood it.

In 1794, during his time with Hegel at the Tübingen Seminary, Friedrich Schelling had written a commentary on Plato's *Timaeus* (see *Tim*) that would feed into the philosophy of nature that he would

[21] From outer to inner: Saturn – (cube) – Jupiter – (tetrahedron) – Mars – (dodecahedron) – Earth – (icosahedron) – Venus – (octahedron) – Mercury.

continue to pursue during his time at the University of Jena and his collaboration with Hegel. Schelling's subsequent 1798 work *On the World-Soul* had caught the attention of the scientifically trained romantic *Naturphilosopher* Franz von Baader who, in the same year published a small book, *On the Pythagorean Tetrad in Nature*, or The Four Regions of the World (Baader 1798; Förster 2012, 240–42), critical of Schelling's adoption of Kant's model of opposed attractive and repulsive forces in nature found in his *Metaphysical Foundations of Natural Science* (*MFNS*).[22] Such opposed forces, Baader argued, should be seen as expressions of a *single* underlying force – gravity or heaviness (*Schwere*) – which was to be regarded as "the immediate expression of the individual inhering in and individualizing itself [*sich individualizierenden*] in all single [*einzelnen*] or moveable bodies" (Baader 1798, 26, quoted in Förster 2012, 241).

There are clear signs of Baader's influence in the *Dissertation* in terms of ideas that would be continued in Hegel's *Encyclopaedia* Philosophy of Nature. Hegel commences Part II of the *Dissertation* with Baader's idea: "Gravity so constitutes matter that matter is objective gravity" (*Diss.*, 186) and later, in the Philosophy of Nature, he continues to describe gravity (*die Gravitation*) in the same way as the "true and determinate notion of material corporeality ... Universal corporeality divides itself essentially into particular bodies [*besondere Körper*], and links itself together in the moment of singularity or subjectivity [*Einzelheit oder Subjectivität*], as determinate being appearing in motion; this, in its immediacy, is thus a system of many bodies" (*Enc.* 2P, §269).[23] There too he notes that the *moments* of gravity "suffer the fate of being grasped as distinct forces corresponding to the forces of attraction and repulsion" such that the "thought of universal gravity is annulled by this" (*Enc.* 2P, §269, remark). In the *Dissertation*, Hegel also linked this Baaderian view to Kepler, who "knew that gravitation was a quality universal to bodies" (*Diss.*, 176).

In the Philosophy of Nature, Kepler's views would be most extensively defended in the Remark added to §270, where the solar system had been described in ways stressing the ideas of *singularity* and *externality*, notions central to his "concept of nature" as such. Thus, the sun, exemplifying the category of abstract universality, stands at an extreme to "lunar and cometary bodies" which express the maximally *external* form of singularity

[22] On Baader's complex relationships to German idealist and romantic thought, see Betanzos 1998, introduction and chapter 1.

[23] In the following paragraph Hegel describes "the concept of gravity/heaviness [*Begriff der Schwere*]" as that which realizes its full freedom it these bodies (*ENC.* 2P, §270).

(*Einzelheit*) while planets "simultaneously stand as much in the determinations of self-externality, as they do in that of being-in-itself; they are in themselves centers and find their essential unity through relating themselves to the universal center" (*Enc.* 2P, §270). We will see that this stress on *externality and singularity* will link Hegel, via Baader's heterodox, neo-Platonic understanding of the Christian Trinitary doctrine, back to Plato's *Timaeus* and its peculiarly *Pythagorean* aspects, and from there to a criticism of Aristotle's formal syllogism.

The "Pythagoraische Quadrat" in the title of Baader's book had referred to a figurative number employed by ancient Pythagorean mathematicians called the "*tetraktys*," consisting of an array of ten elements arranged like the pins in ten-pin bowling – that is, in four rows of 1, 2, 3, and 4 units respectively. Baader, a devout catholic, had linked the *tetraktys* to a triangular representation of the Holy Trinity via a diagram containing an equilateral triangle, the Catholic symbol of the Holy Trinity, with a central point (Baader 1798, 49n). It was meant to somehow link Catholic Trinitarian theology to the world of the ancient Pythagoreans in a way which emphasized the *this-worldly* nature of God's incarnated "son" while, at the same time, avoiding pantheism.[24]

Hegel alludes to Baader's "four regions" of the world in the *Dissertation* in a confusing discussion laden with Schellingian concepts (*Diss.*, 186–87), but Hegel's interest in Baader's Pythagorean ideas is also evident in a now lost diagram, dating from around the time of the *Dissertation* and found after Hegel's death by his biographer Karl Rosenkranz, depicting a "triangle of triangles" showing the inverted embedding of one equilateral triangle within another (Figure 6.1). It clearly relates to both the ancient *tetraktys* and Baader's Quadrat. According to Rosenkranz the diagram had been an attempt to represent what Plato had described in the *Timaeus* as a complex double-relation – a "ratio of ratios" – responsible for the unification of the various parts of the "cosmic animal." Later, in the *Lectures on the History of Philosophy*, Hegel would refer to this "beautiful bond" as a *syllogism*, and in this way, Plato's cosmology could be read as a presentation of the type of logic which Hegel was pursuing in part I of the *Encyclopaedia* and that was to provide the logical presuppositions for the Philosophies of Nature and Spirit.

It has been noted (e.g., Lukács 1975, 121–23; Harris 1983, 184) that while, during the earlier years of his stay in Frankfurt from 1797 to 1800,

[24] Baader also seems to have been responsible for having introduced Hegel and others around this time to the Silesian mystic Jakob Böhme.

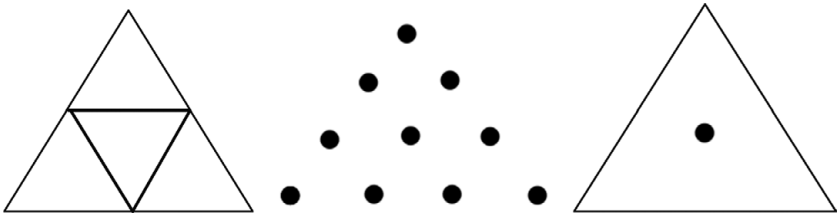

Figure 6.1 Hegel's "Triangle of Triangles," the tetraktys, and Baader's Quadrat

Hegel had been attracted to such "mystical" or "theosophical" elements within medieval Christianity such as Baader's, he nevertheless soon moved beyond these to a more philosophical stance. More recently, Helmut Schneider has insisted that "the 'triangle fragment' does not rest on mystical experience. It is about rational construction and geometrical logic" (Schneider 1975, 139). The account of "the syllogism" in Hegel's Logic clearly has something to do with the syllogism Hegel finds implicit in Plato's cosmology in the *Timaeus* and of which he regards Aristotle's formal syllogism as both an elaboration and reductive distortion.[25] For Hegel, the superiority of Kepler's approach to science, I argue, stems from the fact that it instantiates the type of logic implicit in Plato's cosmology in contrast to the otherwise dominant *Verstandeslogik* implicit in Newton's, which had its ultimate source in Aristotle's formal logic. A key difference in Hegel's account of the Platonic syllogism in comparison to Aristotle's was that Plato's had an explicit four-part structure in contrast to the three-part structure of Aristotle's formal syllogism, and, as with Baader's "tri-une" God acquiring a type of Pythagorean fourfold quality, Plato's concrete fourfold version of Aristotle's trinary syllogism will have to do with its being applied to the three-dimensional world. Hegel's way of characterizing this describes the "middle term" of Aristotle's formal syllogism as being "divided," "split," or "broken" in Plato's syllogism (*LHP-B*, 211).

## 6.3 Hegel's Interpretation of Plato's Timaeus

In Plato's *Timaeus* a peculiar complex of contemporary arithmetic, geometry, and Pythagorean musical theory making up the framework of

[25] For the technical vocabulary of his syllogistic, Aristotle had drawn upon the terminology used in Pythagorean music theory – that is, the same sources as Plato's cosmology in the *Timaeus* (Einarson 1936; Smith 1978). While Aristotle seems to have adhered to much of Pythagorean science (Brumbaugh 1989, chapter 12), he did not accept the application of music theory to cosmology.

Timaeus' mythical account of how the craftsman or demiurge had brought order to the cosmos out of its initial state of disorder can be found (Plato 1997, 28c). The demiurge had wanted everything to be good and nothing bad and brought order to an "out of tune" (*plemmelos*) disorderly state (Plato 1997, 30a), shaping the cosmos into a single living animal of which all other living things formed parts, both individually and as kinds. The question arises, however: How are the parts combined?

> [I]t isn't possible to combine two things well all by themselves, without a third; there has to be some bond between the two that unites them. Now the best bond is one that really and truly makes a unity of itself together with the things bonded by it, and this in the nature of things is best accomplished by proportion [*analogia*]. For whenever of three numbers which are either solids or squares the middle term between any two of them is such that what the first is to it, it is to the last, and, conversely, what the last term is to the middle, it is to the first, then, since the middle term turns out to be both first and last, and the last and the first likewise both turn out to be middle terms, they will all of necessity turn out to have the same relationship to each other, and, given this, will all be unified. (Plato 1997, 31b–32a)

In his discussion of this and related passages in his *Lectures on the History of Philosophy*, and in accord with Baader's linking of the three-part trinity structure to the Pythagorean *tetraktys*, Hegel focuses on how this apparently trinary structure becomes complicated by the idea that not one but *two* middle terms are needed to unify its extremes (*LHP-B*, 211). To understand this, we need to understand something about how the *tetraktys* functioned in Pythagorean thought.[26]

The Pythagoreans had an *arithmetic* worldview, the principle of all number being the "monas" which, besides the unit used in counting, was *also* meant to play the role of a *spatial point*, conceived as a monadic unit "in position."[27] In this way a line could then be conceived as *composed* of such units, two-dimensional figures such as squares and rectangles could be conceived as compounded of arrays of two-dimensional lines, and three-dimensional solid figures as compounded of those planar ones. That is, what *we* know as "square numbers" (numbers multiplied by

[26] On the details of the Pythagorean music theory and cosmology by which Plato had been influenced see, for example, Barker 2007 and Zhmud 2012. Hegel had been influenced by the heavily Pythagorean account of Plato's philosophy promoted by late Neoplatonists such as Proclus. See, for example, Krämer 1990.

[27] As McKirahan points out, the Pythagorean conception of a point as a *unit in position* "skips over the facts that geometrical points are different to arithmetical units, and straight lines are determined by two points in a different way from that in which the number 2 is composed of two units" (McKirahan 2010, 100).

themselves) were, for the Pythagoreans, *literally* square, determinations of *areas* rather than lengths, and "cubic" numbers were similarly cubic.[28] Around the time of Plato, however, this reduction of geometric continuous magnitudes to arithmetic ones was being challenged by a new geometrical approach in which such continua were understood as is some sense primary (Klein 1968, part I) – a view reflected in Aristotle's thought as well as in his logic (Lasserre 1964, 97).

Plato, however, was still more aligned with Pythagorean mathematics, within which the four rows of the *tetraktys* were meant to represent these four spatial dimensions of point, line, area, and volume, the series of exponential powers associated with them, as well as the four fundamental elements, fire, air, water, and earth. Like the kinds of the four substances with which they were associated, numbers raised to different exponential powers were understood as different *kinds* of numbers, with the idea of different and incommensurable *kinds* of magnitude being a deeply held belief within Greek mathematics after the discovery of incommensurable numbers sometime in the fifth century BCE (von Fritz 1945). This was the type of incommensurability holding between curves and straight lines to which Hegel had alluded in his critique of Newton's reduction of curves to straight lines and ultimately points.

Noting that anything with bodily form must be both visible and tangible, Plato has the demiurge compose the body of the cosmic animal out of the elements of visible fire and tangible earth, elements existing at the *extremes* of the *tetraktic* structure, and so having two intermediaries. Along with this, Timaeus points out that *were* the cosmos planar rather than three-dimensional, only a single middle term would be needed, but as it actually is three-dimensional, there is a need for *two* middle terms standing between the monadic elements themselves and the solids into which they were compounded. The demiurge had thus "set water and air between fire and earth, and made them as proportionate to one another as was possible, so that what fire is to air, air is to water, and what air is to water, water is to earth. He then bound them together and thus he constructed the visible and tangible universe . . . making it a symphony of proportion" (Plato 1997, 32b–c).[29]

[28] Heath discusses the way that such "figured numbers" as square, triangular, and oblong numbers were used in Pythagorean calculations in Heath 1921, 1:75–84. This meant, however, that there was no sense to be given to the idea of a number raised to a power *greater* than three.

[29] In part II of the *Dissertation* there are forced attempts to apply the idea of a "split middle term" to various aspects of Kepler's model of the solar system. For example: "From that real difference in gravity, we distinguish the idea of difference, namely, that of the potencies of time and space; for

In relation to Plato's *rational* syllogism with its Pythagorean structure, Hegel portrays Aristotle's formal syllogism as a type of corrupted form with only a *single* middle term (*LHP-B*, 210). Aristotle seems to have been heavily influenced by contemporary geometers who were reacting against the Pythagoreans reduction of continuous to discrete magnitudes (Lasserre 1964, chapter 4). As with continuous magnitudes, the relations among its three terms, A, B, and C, are understood *comparatively* according to the idea of the containment of the smaller in the larger, the *transitivity* of which means if C is contained in B and B in A, then C is contained in A (Aristotle 1989, 25b32–26a3). This is how we how we are to understand how the combination of two *premises*, A–B and B–C, can result in the conclusion, A–C. All of Aristotle's terms must be *general*, as each must be able to play the role of subject (container) or predicate (contained) in a judgment and *singular terms* such as proper names cannot be predicates. There are, then, no remnants of the Pythagorean *monas* (Hegel's *singularities*) in Aristotle's logic. Thus, there is nothing in Aristotle's logic to properly capture the absolute singularities of external nature as understood by Hegel.

## 6.4 Hegel's Logic and the Paradox of Singularity

As emphasized by both Wolff and Martin (Wolff 2020; Martin 2021), Hegel's *Logic* is intended as an entirely *internal* project in which thought determinations are generated from the operations of thought itself. In the *Logic*'s Subjective Logic, we find Hegel's analog of Aristotle's syllogistic but modified such that Aristotle's terms designated by A, B, and C are now identified with Hegel's three fundamental conceptual determinations ("moments" of "the concept"), universality, particularity, *and singularity*. It is tempting here to think of the distinction between *singularity* and *particularity* as defined by the *different ways* in which a thought can be related to an object – the former, as expressed in a "singular term" such as a demonstrative phrase or a proper name, picking out something in its *specificity*, the latter as in a "definite description" that is "satisfied" by

when a twofoldness has been posited, a double twofoldness – one of the poles, the other of the potencies – or four regions, must be posited" (*Diss.*, 186–87). While much of Hegel's language in the *Dissertation* is that used by Schelling in his philosophy of nature, Hegel's use of the split-middle structure is clearly contrary to Schelling's thought. Thus, Hegel describes a "line of cohesion" that seems to allude to Schelling's "constructed line" from his 1801 essay "Presentation of My System of Philosophy" (*PSPh* §§46–50). But while Schelling's line has an extreme divided by one middle term, Hegel's "line of cohesion" is divided by two.

*whatever* worldly object or objects it is *true of*. This is a distinction that had been used by Hegel's effective logic teacher, Gottfried Ploucquet (Ploucquet 2006, §§14–15; Pozzo 2010),[30] and it incorporates the innovation of earlier nominalist logicians (transmitted via Leibniz) so to give a type of "extensional" interpretation to judgments. However, the methodology of Hegel's *Logic* prevents us from understanding the distinction *in this way*. Given its entirely "internal" constitution as the self-articulation of pure thought, there is no equivalent of any *extensional* "semantics" in it. From the purely *logical* point of view, we are to understand singularity as somehow *different to* particularity and universality while related to both. As is argued by Martin (2021), however, such *extensional* semantic considerations start to come into focus in the early paragraphs of the Philosophy of Nature.

Introducing the "concept of nature," Hegel states that "Nature has yielded itself as the Idea in the form of otherness . . . nature is not merely external relative to this Idea (and to the subjective existence of the same, spirit), but is embodied as nature in the determination of externality" (*Enc.* 2P, §247), and this theme of the "externality" of nature is further elaborated in the following paragraph. "In this externality, the determinations of the concept have the appearance of an indifferent subsistence and isolation with regard to one another" (*Enc.* 2P, §248). This combination of "externality" and "singularity" gives a dimension to every actual natural thing what Hegel later refers to as its "infinite singularization or separation" (*unendlichen Vereinzelung*) (*Enc.* 2P, §252).

As we have seen, from a *strictly* logical point of view, the difference between the conceptual determinations of singularity and particularity cannot be accounted for by the question of *how* they pick out worldly objects, but now, in the context of the Philosophy of Nature, this internally articulated system of thought faces a world with its own inherent logical structure, including the element of "infinite singularization or separation." This status possessed by a natural thing *qua* natural clearly *resists* the type of conceptually articulated unification upon which intelligibility relies. Where something is grasped *as* a particular it is grasped in terms of what it has in common with other instances of a universal. *This rose*, grasped in the judgment "this rose is red" can be grasped in terms of what it has in common with other roses or other red things. But when grasped *as singular* such connections must be put in abeyance. Hegel's *split*

[30] Ploucquet describes the distinction as between "exclusive" and "comprehensive" forms of particularity.

*middle term*, I suggest, signals the paradox of the conceptual determinacy of "singularity." When I grasp *this rose* in a judgment, I abstract from its specificity and weave it *as a rose* into the fabric of my understanding. This comes at the price of annulling its "infinite singularization," however. Hegel refers to this as the *contradiction* at the heart of theoretical reason. I seek to understand the thing *as it is* but

> the more thought predominates in ordinary perceptiveness, so much the more does the naturalness, individuality, and immediacy of things vanish away. As thoughts invade the limitless multiformity of nature, its richness is impoverished, its springtimes die, and there is a fading in the play of its colours. That which in nature was noisy with life, falls silent in the quietude of thought; its warm abundance, which shaped itself into a thousand intriguing wonders, withers into acrid forms and shapeless generalities, which resemble a dull northern fog. (*Enc.* 2P, §246 A)

This is the price paid by Newtonian thought in which abstractions come to completely replace the specific entities – Kepler's observed elliptical orbits, for example – that had been concretely perceived. As with understanding the role of mathematics within science, one might advise against confusing "purely *conceptual* relations with the physical ones." The infinite singularization or "separation" of things in nature does *not* mean they are unconnected – if nature is "noisy with life" then clearly there are real *physical* relations at work in the world. What it suggests is that these physical relations cannot be simply reduced to the *types* of relations existing among the determinate concepts we bring to it – concepts mutually determined within the *fixed* oppositions of the "logic of the understanding."

Because of such consequences, Goethe, Schelling, Baader, and various other *Naturphilosophies* had sought forms of science that preserved the immediacy of living nature, but Hegel's solution was different: "what has been dismembered may be restored to simple universality through thought" rather than intuition (*Enc.* 2P, §246 addition, p. 243). By our becoming more *self-aware* of what we are doing when employing concepts in our practical and theoretical engagements with the world we may return to a proper grasp of the living processes implicit in nature itself. In this way Hegel's philosophy of nature does not aim to challenge the results of the working scientist's investigations with an account of how the world they are investigating *really is.* Rather, as based upon a correct understanding of the logic implicit in the empirical investigation of the natural world, philosophy of nature will help the working scientist to avoid the pitfalls brought about by the contradictions implicit within the mind's own

theorizing. Examples of such pitfalls can be recognized in Newton's projections of concepts onto the world, such as the concept of the *infinitesimal*, that, not reflecting empirically detectable existences in the world itself, have to be understood as mere posits of the mind.

It is then in this *indirect* sense that Hegel's defense of Kepler over Newton is premised upon the Platonic cosmology to which Kepler had been attracted: In it, Plato had given the first concrete expression to the logic implicit in the activity of empirical science itself.

CHAPTER 7

# *Hegel's Syllogism of Analogy and Organic Conception of Cosmic Life*
## A Speculative Kantian Legacy in His Absolute Mechanics?

*Cinzia Ferrini*

### 7.1 Introduction

In the Preface to the *Phenomenology (PhG GW* 9: 20.11–15; *PS* 14), Hegel states that both reason and nature are determined as *zweckmäßige Thun*, purposive activity. In Hegel view, this amounts to saying that genuine scientific knowledge of nature – that is, theoretical consideration of nature which is not just an external aggregate of isolated data – is knowledge of what is both universal (genera, laws, forces) and internally organized and finalized (*Enc.* §246/*Enc.* 2P 1: 197). In other words, a judicious, sensible experimental physics "will present the rational science of nature [. . .] as an external image that mirrors the Concept" (*Enc.* §16R/*Enc.* 1: 41). This chapter argues that Hegel's Philosophy of Nature aims to present the advance from the abstract work of the Understanding to the syllogistic work of Reason in the scientific study of empirical nature itself. To do so, I address a neglected issue in the key relation between speculation and scientific empirical knowledge in Hegel's Philosophy of Nature: the role of rational analogies in grounding empirical determinations in the object's inner nature or concept, overcoming Kant's formal division between pure and applied logic and the heuristic role of teleology in cognizing natural products. While dismissing an empty and extrinsic use of analogy in contemporaneous philosophies of nature, which in his view fail to present an empirical instance grounded in the inner nature and universality of the thing, Hegel acknowledges the importance of analogy and appreciates its role in many empirical scientific discoveries. First, I examine Hegel's "syllogism of analogy" in the *Logic* as a concrete, determinate, and objective tool, by use of which the reason of the syllogistic inference is used to cognize the singular nature of things as particulars of a specified universality, focusing on an example drawn from celestial mechanics. I contend that this syllogistic inferential quest for an essential determination of form

appearing as a content determination – filling with probability the gaps of our experience of singularities – is the guiding thread of Hegel's philosophical science of the logical Idea in *its* otherness as system of stages. Then I discuss the role of analogy in the Philosophy of Nature's Absolute Mechanics, accounting for Hegel's view that the structural or constitutive form of the organism already begins to appear in the "ideal" point of unity which governs the movement of free, independent bodies in the solar system, and for his reappraisal of the solar system as manifesting a thorough-going unity (Physics). Finally, I argue for the thesis of a sufficient legacy of Kant's analogical theory of the arrangement of the heavenly bodies in Hegel's self-sublating finite mechanical account of the starry vault in his Philosophy of Nature.

## 7.2 The Logic of the Nature of Things: Reasoning from Judgment to Syllogism

In the first section of his 1816 Doctrine of Concept, Subjectivity, Hegel's logic presents syllogism as resulting from the transition of judgment into a more integrated, concrete, relational form of reasoning. The dialectic movement of subject and predicate posits them through the determinate connection of the copula, which operates as the universal running through the two apparently independent, abstract extremes, thus restoring in the unity of judgment the rational or speculative identity of a concept holding its moments sublated within a whole (*WL GW* 12: 90/*SL* 588). The accomplished result of the copula of the judgment is a (concrete) determinateness as a universal (i.e., a genus, a species, a kind), that is, a specifying qualitative determination, what Hegel calls particularity (*Besonderheit*).

"The Syllogism" is the third and last chapter of that section, preparing for the transition to Objectivity (Mechanism, Chemism, Teleology). In the first subdivision of "The Syllogism," "The Syllogism of Existence (*Daseyns*)," Hegel contends that "the nature" of things (*Dinge*), which he takes as synonymous to "the rational," does not operate by discrete, independent steps, first connecting some particular property (*eine Besonderheit*, e.g., mortality) to a subsistent universal (e.g., humankind) and then discovering a separate connection of a singularity (e.g., Socrates) to such particularity; in that way the rational or concept of a thing, its very "nature," would be no more than a subjective syllogistic inference from one separate proposition to another, as if the syllogism would consist of three judgments (including the conclusion), omitting, in accord with the Understanding's abstract mode of thinking, what really matters: the

mutual, constitutive *relation* of these determinations (*WL GW* 12: 94/*SL* 592). In such a formalistic approach to syllogistic inference, we would cognize only an alleged "essential whole," made up of distinct propositions and links, judging the immediacy of each connection. By contrast, the nature of the Thing (*Sache*) "is that its various conceptual determinations are united in the essential unity," which would be an objective form, grounded in the object's inherent, constitutive kind. Hegel writes that "[a]ll things (*alle Dinge*) are the *syllogism* of a universal united through the particularity with the singularity" (*WL GW* 12: 95/*SL* 593). In the syllogistic conclusion, the connection between singularity and universality is drawn "through a determinate middle which is replete with content, that is precisely the meaning of the syllogistic inference" (*WL GW* 12: 94/*SL* 592). The same approach is maintained in the 1830 *Encyclopaedia Logic*: The syllogistic linkage is not to be regarded as a mere subjective reflection that splits the connection of the terms into isolated premises and a distinct conclusion but is in general "a universal form of *all* things (*eine allgemeine Form* aller *Dinge*)" (*Enc.* §24A$^2$/*Enc.* 1: 59).

How, then, can we make sense of this logical difference between rational (speculative) and abstract or reflected syllogistic inferences in cognizing the form of *all* things for our knowledge of the things of experience? For it goes without saying that in experience "all" can mean only what so far we have encountered, but no "all" cases and not "all" individual things may ever have been observed, and single instances, even within a specific domain, are countless, and therefore "allness" can be provisionally reached only through generalization by induction. How does Hegel account for thinking "allness" and how does he justify his accomplished and well-ground rational, speculative sense of the universal inward nature of "all" the singular things of experience, contrasting it to treating syllogistic inference in a subjective and formalistic way?

It is worth noting that in the 1807 *Phenomenology*'s chapter on "Observing Reason," Hegel compares contemporary classificatory systems of the animal kingdom with animals' own essentially distinguishing marks such as teeth and claws. He states that, between the universality of any scheme and the singularities of the individuals remains an unresolved tension so that the phenomena themselves are simply not captured by their classifications under abstract headings. Hegel views the natural scientists' failure in grasping objectivity as the typical consequence of the separation and external connections of the determinations of natural phenomena set up by the Understanding's logical procedures (*Enc.* §467A/*Enc.* 3P 3: 225). Similarly, in the Philosophy of Nature we find

that the determination of the universal of physics "does not pass over into particularity." In contrast with rational syllogistic inference, the determinate content falls *outside* the universal, and so is split up, shattered, dismembered, and separated (*Enc.* §246A/*Enc.* 2P 1: 202*).*

## 7.3 Grounding Empirical Determinations in the Object's Inner Nature: From Induction to Analogy

The second subdivision of "The Syllogism," called "The Syllogism of Reflection," results from the dialectic of the immediate first form of Syllogism, the syllogism of existence, which sublates the abstractness of its terms in four figures. The second form now presents both terms *and the connection of* the terms, so that each determinateness is not posited as an isolated self-subsisting extreme but *with reference to the others*. On the one hand, Hegel regards the syllogism of reflection as the first to possess "genuine determinateness of form, since the middle is posited as the totality of the determinations" (*WL GW* 12: 111/*SL* 609); on the other, he views the middle term of its first figure, the syllogism of allness, as still an abstract particularity, showing only the (illusory) perfection of the abstract operations of the Understanding, with its external collection of the singular under the universal, granting the independent immediate subsistence of the former in the latter. In short, the examination of the syllogism of allness shows that the singular is connected to its predicate immediately and that we confront the (abstract) external universality of reflection and not yet the (concrete) universality of the concept. However, the thought of the singularity *as allness* is nothing but a new form of syllogism: that of induction or of experience, that is, "of the subjective gathering together of singulars in the genus, and of the conjoining of the genus with a universal determinateness because the latter is found in all singulars" (*WL GW* 12: 114/*SL* 613). Against the backdrop of this form of syllogism, the constitutive feature of any induction or generalization emerges, which can never presuppose completeness in experience: "The a, b, c, d, e, constitute the genus only further on, in the infinite: they do not yield a complete experience. The *conclusion* of induction thus remains *problematic*." Overcoming this imperfection leads to the syllogism of *analogy*. Hegel writes that the truth of the syllogism of induction is a syllogism that has for its middle term a singularity which is immediately *in itself* (*an sich selbst*) universality or is an *essential* universality (*WL GW* 12: 115/*SL* 614). If I say that the "earth" has inhabitants and that the moon is "an earth," I take "earth" both as a concrete singular (this planet Earth) and

a genus (a heavenly body), whereas in induction the middle term is an indeterminate numbers of singulars and in allness the middle term is only the external form determination of all things.

This analogical inferential restatement of any inductive general significance of empirical singularity is open to superficiality and vacuity when the universal that unites the extremes is a property assumed as common on the basis of mere similarity. The 1816 text states that this kind of simple representation "should have no place in logic." In my view, this note is of the highest importance because, against the customary division between content and form, and the customary abstraction of common universals from independent extant particulars of the same kind, typical of operations of the Understanding, Hegel contends that from Subjectivity to Objectivity the logic of the concept advances with *the thought of form made into empirical content*. We are now in the position of thinking about natural things with enduring actual content determination, manifest in observation, and no longer subject to abstraction or to separation between beings and their (universal) essence. He writes:

> But that the form determines itself to content is *first of all* a necessary advance on the part of the formal side, and therefore an advance that touches the nature of the syllogism essentially; *secondly*, such a content determination cannot, therefore, be regarded as any other empirical content, and abstraction cannot be made from it. (*WL GW* 12: 116/*SL* 615)

This assessment overcomes Kant's division between pure and applied logic. Kant holds that logic as *Elementarlehre* (concept, judgment, inference) is neither an organon of truth relative to the content of thought, nor an (heuristic) organon of new cognition but a normative, analytic science of the necessary rules of thinking, the canon of the understanding and reason in their use but only in regard to what is formal (Capozzi 2006, 124–26).[1] Hence, there are logical reasons behind Hegel's disparaging assessment of what he regards as an empty, extrinsic use of analogical inference in the futile play of contemporaneous philosophies of nature (Steffens, Schelling). In §224 of the 1817 *Encyclopaedia*, Hegel mentions the complete failure of astronomy to discover anything rational (i.e., any actual law) regarding the series of planets and their distances from the sun, referring to his own early attempt in the 1801 *Dissertatio philosophica de orbitis planetarum.* In the revised text, §280 of the 1827 and 1830 editions

[1] Capozzi (2006, 127–28) recalls a marginal note (ca. 1794) of Kant's *Logik Bauch* prospecting the desirable *addition* of a chapter on heuristic strategies and provisional cognition to the formal canon of truth exposed in the pure first part of his logic, the Doctrine of Elements.

of the *Encyclopaedia*, Hegel retains his remark on astronomers' unsuccessful attempts but deletes the note about his dissatisfaction with his *Dissertation* and is much more explicit about the shortcomings of contemporaneous philosophy of nature (*Enc.* §280R/*Enc.* 2P 2: 30): In the Addition to §280 we read him disparaging the tentative analogy drawn by Schelling and Steffens between the planetary series and the series of metals (*Enc.* §280R/*Enc.* 2P 2: 31). Recasting at the level of philosophy of nature the example of superficial analogy given in his 1816 *Logic*, Hegel underscores that to ascribe by analogy to the Moon, as an individual heavenly body, the particularity to be inhabited (a particular belonging to the universal of life), on the major premise (of the same form of the conclusion) that the Earth, which is a heavenly body (an earth), has inhabitants, is false because to state that the Earth has inhabitants "does not rest merely on the fact that it is a heavenly body" (*Enc.* §190A/*Enc.* 1: 266).

In light of the 1816 presentation of the syllogism of analogy sketched here, in the case of Schelling and Steffens, the analogy would fail to present an empirical instance grounded in the inner nature and universality of the thing, because further conditions are necessary for life on Earth: atmosphere, water, and so on. As Richard Winfield puts it: "Unless the individual *is* connected to the particular and universal *through its own constitution*, the syllogism [*scil.* of analogy] cannot infer what it infers" (Winfield 2006, 121). We can conclude that Hegel saw that in his *Logic* there was room only for analogy as a concrete, determinate, and objective tool, by use of which the reason of the syllogistic inference is used to cognize the singular nature of things as particulars of a specified universality. In contrast to mere generalization by induction, Hegel acknowledges and underscores the importance of a sound, ampliative analogy that allows transferring properties and information from a known source domain to an unknown target domain, because of essential relations shared between the source and the target analogs. Hegel appreciates its role in many empirical scientific discoveries by providing a *constitutive* criterion to distinguish between superficial and justified, rationally grounded analogies, for both nonliving and living bodies. "True" analogies derive from "the instinct of reason which surmises that this or that empirical determination is grounded in an object's inner nature or kind, and which proceeds on that basis" (*Enc.* §190A/*Enc.* 1: 266).[2]

[2] Hegel thus provides a "constitutive" criterion for good analogies based on identity of ground. In the 1782–83 *Metaphysik Mrongovius*, Kant remarks: "We cannot at all dispense with analogy. Most of our inferences are analogical; we infer, namely: because two things have these properties in common that we know, they will also agree in those properties that we do not know. Of course here deception is also possible, and in many cases actual" (*Ak.* 29: 915/*MMr* 279). In his note to §90 of the *Critique*

This purposive internal drive of rational thinking urges us to truly comprehend sensuous beings as aiming at realizing themselves by expressing their own inward, universal, durable, stable essence (genus, species, kind, laws). But to move the epistemic status of conceptual cognition beyond Subjectivity implies also that the significance and validity of these universals rest in being taken from the perceptually sensed external world, for the *Logic* presupposes the chapter on reason observing the world in the 1807 *Phenomenology*. As is well known, Hegel speaks of empirical science's knowledge as the presupposition and condition for the birth and formation of the conceptual way of considering nature, proper to the philosophical science (see *Enc.* §246/*Enc.* 2P 1: 196–97). To legitimate the speculative syllogistic inferential comprehension of what is actually real and objective in the concrete natural kingdom requires then that Logic shows the connection of these universals in experience by examples, relying on the findings of the natural sciences rooted in the durable, stable, constitutive structure of their objects. Indeed, at this juncture of the text Hegel gives a sound example of analogical inference drawn from celestial mechanics: "It is an example of a syllogism of analogy when we say: 'We have found that all the planets observed so far obey such and such a law of motion, and that *therefore any newly discovered planet will probably move according to the same law*'" (*Enc.* §190A/*Enc.* 1: 266, emphasis added).

In Section 7.4, I focus on the different conception of gravity and solar system at the two different levels of Mechanics and Physics in Hegel's Philosophy of Nature.

## 7.4 The Universal Significance of Empirical Singularity: The Relations of Determinations in the Philosophy of Nature

In his 1823–24 Lectures on the Philosophy of Nature Hegel explains that, although the "basic form" (*Grundform*) of qualitative natural bodies (organic and inorganic) is to appear as merely coexisting, this mutual externality is only a "semblance" (*Schein*). What *essentially* rules the appearance of natural things – and is the sole concern of the philosophy of nature – is the syllogistic process of the concept as "the master that keeps singularities together" (*GVNat* 90).[3] This is to say that even a nonliving

*of Judgment* (*Ak.* 5: 464/*CJ* 328), Kant defines the qualitative meaning of analogy as "the identity of the relation between ground and consequences (causes and effects)," insofar as two specifically different things have a general concept in common.

[3] See on the point Ferrini 2002, 70–74.

celestial mass that is seen to be *part* of a mechanical complex of heavenly bodies rotating around a center of unity exhibits "to the eye of the concept" (i.e., to thought or "ideally") that syllogistic integration into a systematic unity that is also distinctive of living processes.[4] Thus each planet deserves, philosophically, the (organic) designation member (*Glieder*) rather than part (*Teil*). Hegel constantly translates the syllogistic structure of organic life, a universal united through particularity with singularity, into the concrete terms of natural shapes, as it is apparent in a passage from the Addition to §337 of his *Encyclopaedia* and from his 1819–20 course on the Philosophy of Nature:

> Life is where inner and outer, cause and effect, end and means, subjectivity and objectivity etc. are one and the same. The true determination of life is that by the union of the concept with reality, this reality no longer is an immediate and independent mode of being as a plurality of properties existing apart from each other. (*Enc.* §337A/*Enc.* 2P 3: 11)

> [L]ife is *essentially* organism. In the organism the form is this unity, and at the same time these parts of the form are not parts but *members*, they are ideal. (*VNat1* 139.31; emphasis added)

Here Hegel's point is that from the speculative standpoint of philosophical science, what *un*philosophical science views only as self-subsistent "parts" of a complex form are essentially or inwardly interrelated as interdependent *moments* of *one* whole. Hence the real differentiation and division among members is *ideally* and *necessarily* reintegrated into the unity of their common purpose, namely, the conservation of the kind of organism they constitute. In the 1821–22 Philosophy of Nature, Hegel further explains how this "ideal" or speculative structure of life, as movement of division, determination, and reintegration into the unity of universality and singularity, is "the process of leading the members back to identity" (*UVNat* 168).

Coming back to the *Encyclopaedia*, distinctive of Hegel's Philosophy of Nature as a system of stages is that its three main divisions – "Mechanics," "Physics," and "Organic Physics" – show increasing degrees of self-determination and self-preservation (the syllogistic or rational character of organic life) and decreasing degrees of externality and contingency

[4] Elsewhere (Ferrini 2009b) I have shown that this logical speculative element is also what Hegel indicated in the *Encyclopaedia* as the common ground of empiricism and philosophy of nature, which can and must make use of the material that scientific empirical knowledge has developed by drawing from experience, because empirical physics, although it is not comprehending (*begreifende*), speculative cognition, is nevertheless thinking (*denkende*) cognition of nature: See *Enc.* §21A/*Enc.* 1: 52–54; *Enc.* §270A/*Enc.* 2P 3: 269–81; and *Enc.* 3 §422A/*Enc.* 3P 3: 33.

(separation and isolation: the abstract and reflective character of external and merely mechanical relations as used by the Understanding). In the section on "Mechanics," Hegel discusses three kinds of movement: uniform motion resulting from external thrust and expressed by the simple relation of space to time, relatively free motion (where motion accelerates uniformly due to gravity), and absolutely free motion (the movement of orbiting planets in the solar system). These three stages of "Mechanics" show how a relatively homogeneous matter passes from passivity to activity, from being set in motion by external thrust to having the principle of motion within itself. Since matter is defined in "Mechanics" as essentially composite, consisting entirely of discrete parts which all tend toward a center, it is still characterized above all by "essential externality" and is still governed by gravity: It has thus not yet become properly self-determining (*Enc.* §272A/*Enc.* 2P 2: 9). Consequently, as Hegel notes in 1819–20, in this mechanical sphere, the organism "does not allow itself to occur"; that is to say, living organisms cannot be produced by purely mechanical or gravitational motion (*VNat1* 139.18). At a logical level, this means that the type of object referred to in "Mechanics" is not yet *thought* as a subject that maintains itself during its effective realization, for it is taken as "attaining concrete existence through other corporeal individuals" (*WL GW* 12: 241/*SL* 740). However, the *structural or essential* (not yet actualized) *form* of the organism has already begun to appear in the "ideal" point of unity that governs the movement of free, independent material parts in the solar system: the sun in relation to orbiting bodies which carry the principle of motion (gravity) within themselves.

Already in his 1801 *Dissertation on the Orbits of the Planets*, Hegel called the planets of the solar system "animals," indicating they are organized bodies endowed with an autonomous inner principle of motion. However, due to their confinement by a central body regarding mechanical motion of mutually external and independent bodies, in the section "Mechanics" of his Philosophy of Nature, Hegel regards the solar system as the *first* organism, or "only" an organism of mechanism:

> In the system of the heavenly bodies [. . .] all particular moments of the concept exist freely for themselves as independent bodies which have not yet returned into the unity of the concept. The first organism was the solar system; it was merely implicitly (*an sich*) organic however, it was not yet an organic existence. The gigantic members of which it is composed are independent configurations (*Gestalten*) and it is only their motion which constitutes the ideality of their independence. The solar system is merely an organism of mechanism. (*Enc.* §337A/*Enc.* 2P 3: 11, trans. revised)

Only at the higher stage of Physics do we have a kind of object that is "real" matter; or, in Hegel's terms, matter having a certain inner *form* which it *manifests* (in its empirical being) as *its own essential form*. This inner form endows bodies with *individuality* (and a distinctive *quality* or specificity) that bodies lack insofar as they are taken and understood as purely mechanical bodies (or mere quantities of indifferent parts of matter, disregarding body's inner composition or structure):

> These bodies now come under the power (*Macht*) of individuality. What follows is the reduction of the free bodies under the power of the individual point of unity, which digests (*verdaut*) them. Gravity, as the inward essence of matter, only inner identity, passes [. . .] into the manifestation of essence. (*Enc*. §272A/*Enc*. 2P 2: 9, trans. revised)

In the first qualified state of matter, gravity thus ceases to count as an undifferentiated heaviness that ignores internal differentiation, and matter's general and abstract appearance to and for others (not for itself) becomes light. Hegel argues in distinct stages that light manifests (outwardly) the inward essential identity of gravity in the heavenly bodies, by reducing the apparent autonomous independence of these "animals" to moments held sublated within the unity of cosmic life, as individual manifestations of their living essence, *appearing* as particulars of a universality:

> It is the property [. . .] of organic being to digest the completely universal astral powers which appear to have independence as heavenly bodies, and to bring them under the sway of individuality, *so that these gigantic members reduce themselves to moments*. (*Enc*. §280A/*Enc*. 2P 2: 31, my emphasis)

and:

> Living existence posits everything particular as appearing (*als erscheinend*), however, and so holds these gigantic members [i.e., heavenly bodies] within a unity. In life, therefore, light is the complete master of gravity. (*Enc*. §337A/*Enc*. 2P 3: 11)

In the Philosophy of Nature of 1805–6 (*JS III* 108.5–8) we find a clear assessment of how and why with the physical dimension of light we reach the thought of the universal form of "life": the key notion is the *thorough* co-penetration of *all* the parts of a transparent body (i.e., a glass, a crystal) by a *unity* of presence and actuality. Light exemplifies a unity of space, externality, and generality, which thoroughly co-penetrates all parts of a body, though still in an external, *simple* way. Hence the unity realized by light is not yet that of "the singular (*einzelne*) self," as is the case with organic nature or the self-conscious "I" at the higher level of the

philosophy of spirit. However, since the spectrum of colors light displays results from its inner principle of differentiating *itself* when it thoroughly permeates the material structure of the body it illuminates (i.e., the prism); light, though simple, is no longer the kind of unity that governs the motion of parts that remain *external* to their center.

This is why "Physics" reappraises the system of the heavenly bodies, noting features absent from the previous section on celestial or absolute mechanics. What was previously understood as a mere organism of mechanism is now determined as the manifestation of a *thorough-going* unity – the wholly universal, "cosmic" *life* in which all heavenly bodies participate. This life is constituted by the *union* of the mechanical connections among heavenly bodies governed by gravity with their physical relation governed by the Sun's light. By regarding the Sun as a star, we reach the stage of matter in the condition of unity: "This physical relationship between the heavenly bodies, together with their mechanical relation, constitutes cosmic nature, which is the foundation, the completely universal life, in which the whole of animated nature participates" (*Enc*. §279A/*Enc*. 2P 2: 29). Indeed, only when matter is regarded as *inwardly self-determining*, and the sun is no longer understood as merely a center of motion but *also* according to its higher determination "as self-sustaining natural source of light" which illuminates all the planets and is the source of life on Earth, do we have light as the complete *master of gravity* that holds the "gigantic members" of the heavenly bodies within a unity that has the principle of difference within itself and is *immanently active* (*Enc*. §337A/*Enc*. 2P 3: 11) in the entire solar system as a whole. The solar system is in fact a system for it is in itself an "essentially interconnected totality" (*Enc*. §279R/*Enc*. 2P 2: 26). Otherwise stated, only at the stage of the qualified matter of individual bodies, no longer characterized by weight as one abstract totalizing feature, do we have the thought of the solar system as the *syllogism* of the sun (as the moment of universality), the comets, and the moon (which represent the moment of particularity) and the singularity of the planets (the moment of the reflection within itself, the unity of universality and particularity, *Enc*. §279A/*Enc*. 2P 2: 29).

In this brief survey of the principal stages of Hegel's speculative approach to the heavens there are some mutually connected distinctive points worth noting: (1) The importance of analogy in extending the known to the unknown and the acknowledgment of rational analogies grounded in the inherent kind of the natural object, with reference to our scientific empirical knowledge and celestial mechanics; (2) the comprehension of the heavenly bodies not as parts but members of a systematic,

organized whole as the organism of mechanism; and (3) the *physical* role of the luminescent stars as points of unity and their essential inner linkage with their orbiting planets.

In Section 7.5, I try to show that there is a Kantian speculative legacy in Hegel's approach regarding these key points.

## 7.5 A Kantian Legacy in Hegel's Absolute Mechanics?

Traditional readings may regard my attempt as misguided, for at least two reasons:

1. Kant's cosmogony had a different goal from Hegel's speculative, rational syllogistic cosmology in his Philosophy of Nature: In 1755 Kant aimed to provide a genetic natural history of the heavens, in which, inter alia, the formation of planets and the causes of their systematic relations were to be determined from the characteristics of their presently observable configurations, by analogically extending Newton's laws beyond the solar system. Moreover, in Kant's account, the main issue at stake was to demonstrate that the beauty and regularity of the heavens were due only to the inner development of the mechanical properties of matter, through the divine artistry concealed within their own (blind) lawfulness.
2. In 1755 Kant maintained that God's plan and activity endowed lifeless or inert matter with properties so that its smallest parts could arrange and join themselves into systems, such as the fixed stars in the Milky Way, taking by analogy (in space) all the stars moving in one vast ring like those of Saturn.[5] In the Addition to §268 of his Encyclopaedia, on Finite Mechanics, Hegel states that the fall of heavy matter, described in Aristotelian terms as "the effort of matter to reach one place, as center," is more adequate to the concept of matter than inert matter. The abstract positing of a single center has the logical moment of the "one," or self-identity, through sublating the other necessary logical moment of the "many" or becoming other. However, falling "is the one-sided positing of matter as attraction" because it still lacks the moment of differentiation of the center within

[5] See *THA* 250/217: "Thus all the suns of the firmament have orbital motions either around one universal center point or around many. In this context, we may use the analogy of what has been observed in the orbits of our solar system, namely that the same cause that has imparted centrifugal force to the planets as a result of which they describe their orbits, has also arranged them in such a way that they all relate to one plane."

> itself as posited by gravity. Heavy attracted matter is not yet real true matter as it has not yet posited itself in the determinations of all the logical moments of its concept or internal essence. Real repulsion is "where the center repels itself, multiplies itself so that masses are posited as a many, each with its center," as in the third main division of absolute mechanics and absolutely free matter, which, in its existence, is completely adequate to its concept and is rationally conceived. Within this context, as an example of formal, abstract repulsion, Hegel considers the host of fixed stars beyond the Sun. They constitute a formal world where dead repulsion finds existence, because "as bodies they are as yet simply multiple and exhibit no difference"; their plurality within immensurable spaces is of no significance to reason, since they exhibit mere externality, emptiness and negative infinity. Stars here "are not yet to be regarded as luminous, for this is a physical determination." Hegel regards the heavenly vault as a sphere of interest only for human feelings, not for philosophy, by speaking of the "admiration" of the serenity of the night sky, the "delight to the eye" of stars' lights, and the contemplation of their tranquility to calm a passionate heart. Against this backdrop, it would appear difficult, or at least controversial, to speak of any specific, significant Kantian legacy in Hegel's theory of the heavenly vault.

However, exactly in the same Addition to §268 where, mechanically speaking, the plurality of stars is said to be the realm of abstract and infinite diremption, Hegel makes clear that any rational and speculative interest in them, that is, any conceptual comprehension of the expression or appearance of any essential, internal relations, would rest upon their way of grouping, that is, in the figurations in which they are reciprocally disposed, although:

> Little can be said about the necessity of these figurations. Herschel has noted forms in nebulae indicative of regularity. The spaces are emptier as the distances from the Milky Way increase, and from this has been concluded (Herschel and Kant), that the stars form the figure of a lens; but this is something wholly indeterminate and general. (*Enc.* §268A/*Enc.* 2P 1: 259)

We will start from this piece of evidence. Despite the caveat of indeterminacy and generality, Hegel himself acknowledges sharing at least one speculative point with Kant's cosmogony: the quest to comprehend the expression of the inherent relational nature of the stars through their (geometrical) external configuration, to the point that Hegel also speaks of the host or plurality of stars as a "system," though setting it at a lower

level in respect to the solar system in which we first discern the system of reason as a reality in the heavens.[6]

In the 1755 *Universal History and Theory of the Heavens*, Kant had explained the origin of heavenly bodies by assuming that their matter was at one time separated into its elements of varying sizes and densities and scattered through infinite space. In the opening paragraph of the Preface, Kant writes that his audacious aim is: "To discover the systematicity which binds together the great members (*Glieder*) of creation in the whole extent of infinity, to derive the formation of the celestial bodies themselves and the origin of their motions, from the first state of nature through mechanical laws" (*THA* 221.5–9/194, translation revised). He then claimed that matter organizes itself by attraction and repulsion so as to revolve about a common center of gravity, and his nebulae hypotheses endorsed Maupertuis' view of the fixed stars as suns like ours, very likely ("for reasons of nature and analogy") revolving about an axis and a common plane (*THA* 252–53/219). Maupertuis argued for the notion of the specific flattened elliptical configuration of an apparently disaggregated plurality of stars as expressing their internal mutual relationship, for they were seen to group geometrically according to a common plane (what Hegel calls "the figure of a lens").[7]

Kant's 1755 *Theory of the Heavens* was published anonymously, its publisher soon went bankrupt, and most copies of it were impounded. For decades, Kant's precritical cosmogony was mostly known through the 1763 *Beweisgrund* as an argument proving God's existence. In Hegel's time, the text circulated in the new, corrected edition of 1797, published by Voigt, in Tieftrunk's 1799 collection of Kant's essays, and in reprints or minor editions.[8]

It is worth considering that by referring both to Herschel and Kant, Hegel appears to refer to the 1791 German edition of W. Herschel, *Über den Bau des Himmels*, to which was appended "an authentic excerpt" from Kant's 1755 *Theorie des Himmels*, abridged for the occasion by the

[6] "The host of stars is a formal world, because only this onesided determination is able to hold sway there. As a system it should not be put on a level with the solar system which for us is the primary knowable system of real rationality within the heavens" (*Enc.* §268A/*Enc.* 2P 1: 258).

[7] Kant quotes (in the original French) the second, augmented 1742 edition of Maupertuis' *Discourse sur les différentes figures des astres*, from an excerpt published in the 1745 *Acta Eruditorum* (*THA* 233–34/203). Maupertuis used our solar system to model any stellar nebula, regarding its stars as rotating about a common axis, so that the nebula would likely have a flattened form of an elliptical figure (Maupertuis 1742, 76–77).

[8] For a list of the early German editions of Kant's 1755 work issued before Hegel's death, see Albrect and Delfosse 2009, xliii.

school inspector J. F. Gensichen upon Kant's personal request and under his supervision (Herschel 1791, 161–62).[9] This Appendix was said to contain the "very gist (*das Wesentlichste*)" of the 1755 work (Herschel 1791, 201), and at the beginning of his own note to the Appendix, Gensichen assured the reader that the excerpt reported what the author would have written in 1755 if he had wanted to expound his thoughts briefly.

Elsewhere I have shown that, despite assurances, the text is very far from a simple and neutral condensation, essentially representative of Kant's precritical cosmogony, insofar as, thirty-six years later, all reference to the derivation of the essential properties of elementary matter from the divine intelligence is deleted.[10] A comparison between the 1755 and the 1791 text documents how Kant shifted from a genetic theological explanation based on dogmatic mechanics to a descriptive critical one, more explicitly based on a chemical-dynamical framework, pointing to the union of mechanism with unintentional natural ends in the systematic self-formation of inorganic matter. In 1791, Kant claims that chaotic matter has merely "an endeavor (*eine Bestrebung*)," that is, a striving, a tendency, "to self-forming (*sich zu bilden*)" into a perfect constitution through natural development: Though renouncing any speculative theory about origins, Kant's critical reassessment remained compatible with an argument from God's design.

To speak of *Bestrebung* in cosmogony without reference to God's plans and will should only connote an original, immanent predisposition of matter to indeterminate purposiveness, an efficient causal tendency to acquire a determinate, complete form. Contemporaneous readers would have understood this to involve a theoretical and analogical extension of the *Bestreben* from the living back to the nonliving, phenomenal realm. In this period, *Bestreben* was used to indicate the formative force (*Bildungstrieb* or *nisus formativus*) by which all organisms assume their own determinate shape. As a matter of fact, later Blumenbach himself explicitly distinguished between *Bildungstrieb* (*nisus formativus*), a vital force operating only on the generative substance of living organisms, and *Bildungskraft* (*vis formativa*), a force operating on the progressive formation of structured but inorganic bodies such as crystals.[11]

[9] In 1785, Herschel had published his *On the Construction of the Heavens*; in 1790 he presented to the Royal Society the memoir *On the Satellites of the Planets Saturn, and the Rotation of its Ring on an Axis* (see Grillenzoni 1998, 203n53). On Gensichen's excerpt, we have a letter from Kant to Gensichen dated April 19, 1791 (*Ak.* 11: 252–53/*Corr.* 375–77).

[10] In the following comparison between Kant's 1755 and 1791 cosmogony, I draw upon Ferrini 2004.

[11] For details and discussion, see Fabbri Bertoletti 1990, 33–34.

Considering what Hegel could more likely have had at hand, it is worth referring also to J. C. Schwab's review of Kant's 1791 cosmogony. Schwab admits that he had no first-hand knowledge of the 1755 book, though he was acquainted with the 1763 exposition; thus, when he comes to speak of the introduction of chemical attraction in the self-formation of the planets, he stresses that no mention of that force was made in 1763 (Schwab 1792, 11), indicating this aspect as a true novelty in Kant's account.

Indeed, central to Kant's 1791 view was to make more explicit that masses form from chaos not only because matter is mechanically endowed with a motive power but because it unites the (blind) capacity for movement (mechanism) with the specifically oriented attraction of chemical affinity: Affinity belongs to the qualitative constitution of the body itself, it works inwardly to form its shape through the reciprocal action of specifically different matters. In this way Kant explained the composition of planetary bodies by parts which reciprocally produce each other, regarding their form and combination.

I contend that from this standpoint, Kant's legacy to Hegel is the comprehension of the systematicity of the Heavens as a kind of "organism of mechanism." In a passage of the *Critique of Judgment*, Kant distinguishes between the causal relation among parts in a watch and in an organized natural product, stressing that, since neither one wheel produces the other, nor the watch reproduces itself organizing other matter for this purpose, then a watch cannot by itself replace damaged or lacking parts, or somehow repair itself when it has fallen into disorder (*Unordnung*). Hence, he concludes:

> An organized being is thus not a mere machine, for that has only a motive power (*bewegende Kraft*), while the organized being possesses in itself a formative power (*es besitzt in sich bildende Kraft*), and indeed one that it communicates to the matter, which does not have it (it organizes the latter): thus it has a self-propagating formative power (*eine sich fortpflanzende bildende Kraft*), which cannot be explained through the capacity for movement alone (that is, mechanism). (*Ak.* 5: 374/*CJ* §65, 246)

Note that, in analogy with plants and animals, to which the passage is chiefly addressed, the question of a natural being that possesses a power that it communicates to matter recurs in *Reflexion* 45, where the verb *fortpflanzen* (to propagate) is used by Kant, not just to identify the kind of force that inheres in living organisms so far as they are not machines but to define the action of fire, with heat viewed as something that "communicates itself."[12]

[12] See *Ref.PC* 45: 364: "Die Wärme theilt sich mit, aber Flamme planzt sich fort."

Likewise, as early as 1755, Kant ascribed an inorganic power, analogous of the organic power of self-repair when disordered, to heavenly bodies in the course of their self-formation.

It seems to me that the same view is echoed in the Kantian notion of *Unordnung* stated in §65 of the *Critique of Judgment*: It appears that the relation between cause and effect is identical in both organic and inorganic cases, and is therefore analogical in this formal sense, since the latter case pertains to structured nature (heavenly bodies and crystals, so far as they are not cognized as aggregates but as systematically organized natural products). Hence it appears that in his 1791 "critical" cosmogony, by also giving new significance to some earlier tenets, Kant suggests that the heavenly bodies should be judged (reflectively/aesthetically) as natural ends in themselves and thus in accordance with their inner possibility, namely that their formation should be investigated by taking as a guideline a process of the organization of matter that, as in the case of crystalline structures, is analogous to the formation of living organisms with regard to the concept of purposiveness.

Against this background, the systematicity of the Heavens is no longer seen as the problem of explaining the harmonic arrangement of blindly formed bodies, through the common origin of the essential properties of their matter in the design of God's infinite Understanding (as also in 1763). Instead, Kant's 1791 revised problem is the philosophical grounding (a priori) of that which pertains materially to the possibility of the actual existence of the heavenly bodies as masses whose free formation is based on "indeterminate" purposiveness due to the "technique" (*Technik*) of nature, brought about by emerging selective (chemical) attractive forces.

Hegel could have well seen here in Kant what he calls the "instinct of reason," surmising that an empirical determination is grounded in the inner kind of an individual object – because no part of the Heavens was posited as either independent or necessary on its own account but with reference to the others – according to the hypotheses that parts were arranged as self-organizing members of a whole in greater unities.

Echoed by Hegel, who, in the Addition to §268 of his *Encyclopaedia* on "Finite Mechanics,", compares the infinite plurality of luminescent stars to a swarm of flies, Kant had also declared (in 1755) to have regarded bright points we see filling the space above us "as a scattered milling mass without visible order" (*Ak.* 1: 231/*THA* 201); that is, as a confused and dispersed cluster, before changing his view under influence of Thomas Wright's *An Original Theory or New Hypothesis of the Universe* (1750). Kant's 1791 version retains this contrast to the view of a scattered heap of an inconceivably numerous host of stars deriving from an original state of

disorganized, dispersed matter; Kant's focus is not on the aspect of representing an immeasurable multitude as due to the effect of repulsion; rather, the aesthetic feeling of the subject in judging the beautiful was occasioned by seeing an arrangement and grouping of the stars, what Hegel calls their *Figuration* around a common center.

It seems that even at an early stage of his development, Kant already saw that any aesthetic appreciation of the fixed stars must be sought only in the mind of the one who judges, depending upon a shift in the view: from regarding the fixed stars merely as a shapeless disorganized multitude, to considering them as systematically arranged according to an order which, though perceived without the presentation of any purpose, indicates their relation to a common plane. In §26 of the 1790 Critique of the Aesthetic Power of Judgment, the "immeasurable multitude" of the "nebulae," systems of the Milky Way "which presumably constitute such a system among themselves in turn," are mentioned as an example of the mathematically sublime in nature in mere intuition. However, the aesthetic judging of the nebulae exemplifies the mathematical sublime in nature, not for the magnitude of the number but because "as we progress we always arrive at ever greater units" (*Ak.* 5: 256/*CJ* 140).

All of this line of argument seems echoed by Hegel in the Addition to §268, which notes that the subjective interest of feelings (with the exclusion of any objective interest of reason) in the contemplation of the fixed stars appears only after comparing the infinite plurality of luminescent stars to a swarm of flies. Terms such as "admiration," "delight," and "contemplation" appear only within the context of the fixed stars regarded as a system, when Hegel refers to them as representing crystallizations which have a lawful inner connection (*Enc.* §268A/*Enc.* 2P 1: 258).

In the 1813 Doctrine of Essence of the *Science of Logic*, Hegel highlights how knowledge cannot advance and runs into circles when making formal distinctions and proceeding by premising as ground that which is in fact derived, as in the case with the mutual attractive force of the Sun and the Earth and in the processes of crystallization:

> For instance, the ground for the planets moving around the sun is given to be the reciprocal attractive force of the sun and the earth. So far as content goes, this says no more than what is contained in the phenomenon, namely that the movements of the two bodies are correlated, except that it is expressed in the form of a determination reflected into itself, that of force. If it is asked what kind of force this attractive force might be, the answer is that it is the force that makes the earth move around the sun, that is to say, it has exactly the same content as the existence for which it is supposed to be

> the ground; the connection of the earth and sun with respect to motion is the identical substrate of ground and grounded. – When a form of crystallization is explained in this way, namely that it is grounded in the particular arrangement into which the molecules enter with one another, the actual crystallization is this arrangement itself, except expressed as ground. These etiologies, which are the privilege of the sciences, are valued in ordinary life for what they are – tautological, empty talk. (*WL GW* 11: 304/*SL* 399)

By contrast, in the 1832 Preface to the second edition of the *Science of Logic*, Hegel praises the recent significant adoption of the dialectical category of polarity in physics, when previously predominant was the reflective category of force, thus marking an advance from the abstract work of the Understanding to the syllogistic work of Reason in the scientific study of empirical nature:

> It [scil. polarity] defines a difference in which the different terms are inseparably bound together, and it is indeed of infinite importance that an advance has thereby been made beyond the abstractive form of identity, by which a determinateness such as for example that of force acquires independent status, and the determining form of difference, the difference that at the same time remains an inseparable moment of identity, is instead brought to the forefront and is given general acceptance. The study of nature, because of the stable reality of its objects, is inevitably led to fix categories that can no longer be ignored in it [. . .] it is not given room from abstracting from opposition and moving on to generalities. (*WL GW* 21: 11–12/*SL* 13)

At the time of Hegel's philosophy of nature, galvanic chains based on the thesis of the fundamental polarity of any natural process were presented as showing the very essential content, the internal linkage connecting the complex of nonmechanical modalities of self-organization of matter found in active phenomena such as manifestations of electricity, the effects of thermomagnetic chains, combustions, chemical transformations, and finally the formation processes of crystallization: "von der kleinsten Regung bis zum kosmischen Rhythmus der Planetenbewegung" (Pohl 1826, xiv).[13]

## 7.6 Conclusions

I have shown that Kant's 1791 analogy between the chemistry involved in the self-structuring or self-forming processes of crystallization and those laws of

[13] Hegel had in his library a presentation copy of Pohl's 1826 work. On Hegel's taking the side of Pohl (who attended Hegel's lectures in Berlin) in his polemics against Berzelius, endorsing Pohl's highlighting "German's speculative awareness of the vitality of nature" and the role of philosophy in chemical theory, see Burbidge 1996, 146–47.

chemical combination which regulate the initial formations of heavenly masses from dispersed and very thin particles of cosmic matter paved the way to a further analogy between the systematicity of the arrangement of heavenly bodies (and crystals) and the organization of organic, living beings. In my view, Hegel's approach to true analogy as grounded in the inner nature or constitutive kind of an object and his mechanical account of the heavens in terms of systematicity and organism of mechanism inherits Kant's theory of the Milky Way based on "reasons of nature and analogy," and owes a debt to the Kantian view of the heavenly bodies as *members mutually connected in further unities*; the same holds for Hegel's reference to the inner connection representing crystallizations which relates systematically the fixed stars of the Milky Way according to their figurations, thus making their essential linkage or rationale manifest to observation. For both Hegel and Kant, mere mechanism treats the stars of the Milky Way only as scattered innumerable parts of a complex form, whereas they are essentially or inwardly related as interdependent *moments* of *one* whole.

Against this backdrop, it seems to me that we can retrace the presence of a significant Kantian legacy in Hegel's Finite Mechanics regarding the intrinsic limits of any mechanical explanation also for organized nonliving natural products, which show the necessity to subordinate Newtonian attraction among indifferent masses to the prior operations of specific laws of chemical affinity. In Hegel's reappraisal, these intrinsic limits would mark the transition of the gravitational masses of Mechanism into the chemical objects of Chemism. In the terms of the *Science of Logic*, the kind of object of Mechanism is a nonindividual external object, striving toward a middle point because it lacks self-subsistence and determinate difference, ruled by a law immanent within it that constitutes its nature and power. The second kind is a determinateness posited by the concept; idealized difference is immanent within it, and though not yet living, the object of Chemism strives toward the object *determinedly opposed* to it. In terms of the Philosophy of Nature, Hegel's reference to processes of crystallization regarding the inner linkages of the Milky Way's elliptic figurations marks the initial presence of the higher logical sphere of Chemismus in the lower Mechanism (as the sphere of gravity taken as undifferentiated heaviness without internal differentiation), and the movement of self-superseding of the latter into the former through Physics, where universal matter is particularized and qualified, the highest achievement of which is to make manifest the point of unity that contains the difference of the various material components within itself, becoming fully individualized matter.

CHAPTER 8

# *Hegel's Mechanics as a System of Steps from Space and Time to Celestial Motion*

*Ralph M. Kaufmann*

## 8.1 Introduction

The treatment of mechanics has a threefold role in Hegel's system. As a necessary step in the ladder of nature, it realizes the more ideal step of time, space, their dimensionalities, and interactions; explains the inner truth of the laws of mechanics; and forms the basis of all further analyses. The outcome is a tetrapartite system that brings into reality the different motions and centers and physically displays the logic of a dialectic with two particulars as is necessary in his system to describe nature and its processes. Hegel's intermediate goal is not to merely rederive Kepler's laws or equations of motions but to offer a deeper reason, a truth for them founded in a hierarchical system in which free motion is as individual freedom not unrestrained unboundedness but a positioning into a governing system, not as a mere subject but as a subject-object which retains certain degrees of freedom. This approach differentiates Hegel from both Kant and Newton. The system-inherent importance cannot be overstated, but the relevance for physics can easily be understated by neglecting the metaphysical aspiration.

There are indeed questions which are still open today that Hegel addresses. Why are there real-world quadratic central potentials which are crucial to the existence of life as it is? The behavior of these laws is intimately tied to having the power of two in a three-dimensional space. What are forces exactly? How do they "attach" to a body? How does action at a distance work, which these forces presuppose? How much physical and metaphysical content is contained in the mathematical theory of vector addition and free body diagrams? How are the initial conditions for the solar system or the universe set? What is mass? Given that $E = mc^2$, identifying mass with energy up to a constant, this question has become more complicated. For calculational purposes these questions are perhaps irrelevant but for an understanding they pose pertinent challenges.

Hegel might not have a complete set of answers here, especially for those critical to his notion of dialectic, but in an uncanny fashion he pinpoints exactly the dark spots for which a deeper understanding is metaphysically relevant. He offers interesting concepts and constructs for the analysis that are to some extent realized in modern theory. To make these accessible, we highlight Hegel's specific constructions by tracing his argument intrinsically, concentrating mostly on the system-immanent aspects, commenting only briefly on the relations to Kant, Newton, and classical mechanics.[1]

## 8.2 Analysis

The ostensible aim of the sections on finite and absolute mechanics is to give an understanding, versus a mere mathematical computational tool, of classical mechanics in a multistep process that parallels the dimensional unfolding of space, time, and movement, given by heaviness (*Schwere*), collision, fall, and gravitation or "absolute mechanics," that is, celestial movement as governed by Kepler's laws. Hegel does not use the terms *Schwere* and *Gravitation* interchangeably, which is why we translated the first one as heaviness. As explicated later, heaviness is a basic property of extended matter, while gravitation is the term for a gravitational system comprising many bodies.

This touchstone, which Hegel deems "of the utmost beauty of what natural science has to offer" and the "most interesting to comprehend" (*Enc.* §270A, 96), appears at a crucial point of the development of the whole theory, wedged between considerations of space and time and the following section on physics, which ultimately leads to living organisms. This positioning and argument are not haphazard, as in Hegel's theory matter and motion emanate directly from time and space and are the basis for all more complex structures and processes, be they physical, chemical, or organic. In his system of steps, it is necessary that this paragon of natural science is not isolated but both builds on what has already been laid out and provides the basis for the further rungs: "Nature is a to be considered as a system of steps, where the next step necessarily results from the previous one providing the truth of the previous one, but not in a natural

[1] There has been a great amount of work on this subject of Hegel, Kant, and Newton. I mention Inwood 1987, Halper 2008, and Ferrini 2012 for excellent overviews and refer to the comprehensive volume Petry 1993.

genesis kind of way, but as an inner idea that provides the reason of its nature" (*Enc.* §249, 31).[2]

It might seem odd that the macro scale of the solar system is the basis for the micro scale of life or even cell life. Hegel (*Enc.* §252, 38) argues that although there are, *prima vista*, two valid directions of analysis, one moving from the existing into the abstract and one starting from the abstract particularizing to the more concrete, the latter is de facto the only choice: "Since the establishment of conceptual definitions is of vital importance, we should not start with the real sphere, but instead begin with the most abstract." This method is not to be misconstrued as a top-down explanation of all details of nature especially the accidental ones (*Enc.* §250, 35), but tracing the necessary concepts is what allows for spirit (*Geist*) to comprehend its essence in nature ("Geiste die Erkenntnis seines Wesens in der Natur gewährt" (*Enc.* §274, 24)). It is in this vein that the sections on mechanics have importance to both the understanding of Hegel and more broadly a metaphysical discussion of physical theories.

There are several interweaved lines of thought that are brought to bear in the analysis. The first is the relationship of space, time, motion, and matter with their dimensionalities and interrelations. These are used as a measure to gauge the progression of the discussion and the realization of the concepts (*Begriff*). This is a continuation of the analysis of space and time that ended with locus (*Ort*), movement, and matter as a synthesis of these. A second, new aspect of the theory is the notion of centers which plays a fundamental functional role in the subsequent analyses. Centers appear in the transition from matter to a plurality of matter, which in modern terms can be understood as the transition from point-like matter to extended matter – although one must be cautious not to import too many preconceived notions. Extended matter or bodies are considered as one unit subsuming a multitude that constitutes both centers and heaviness. This heaviness is the concept underlying mass, both inert and gravitational, grounding it simply in plurality of matter and striving toward a center.

The existence of centers and their quality of being real or ideal is one of the key principles in Hegel's system. The different constellations of these centers classify the steps of the mechanics and serve as a main feature to contrast Newton's approach to that of Kepler, to which Hegel is more

[2] "Die Natur ist als ein System von Stufen zu betrachten, deren eine aus der andern notwendig hervorgeht und die nächste Wahrheit derjenigen ist, aus welcher sie resultiert, aber nicht so, daß die eine aus der andern natürlich erzeugt würde, sondern in der inneren, den Grund der Natur ausmachenden Idee." All translations are provided by the author.

sympathetic as it has a more global description. This preference is not merely about mathematical or physical simplicity or aesthetics, but it is crucial for Hegel, as the wider applicability of these types of motions all the way up to biology and sociology in a system of steps are at stake (see Kaufmann et al. 2021). This accounts for the necessity of having a bound elliptic motion be the free motion rather than a circular motion, or the classical Newtonian straight-line motion. In Hegel's system the former is not complex enough, as measured by degrees of freedom and dimensionality, and the latter is devoid of any metaphysical meaning. Parallel to the development of the notion of time and space one can express this in modern terms as a locally free motion and a globally free motion (see Kaufmann and Yeomans 2023). The locally free motion is the linear view, just like the unfolding of dimensions of space, while the globally free motion can be seen as a system of inclusions, which reaches beyond the linear in a bounded motion.

In the lead-over to physics Hegel, in a third line of thought, constructs a system of four celestial bodies, starting from the central potential with two bodies, sun and earth (sometimes planet), then augmenting it with the moon to obtain a tripartite system – as it appears in his dialectic and logic – and finally adding the fourth constituent, the comet, as a second particular (*Besondere*). While the tripartite structure reflects the syllogisms and their interpretation by Hegel, this tetrapartite system is what is necessary to be able to classify nature:

> The totality of the disjunction of the concept exists in nature as a quaternity because the first is the general, but the second, or the difference, appears in nature as doubled, as the different needs to exist in nature for itself as a differentiated, so that the subjective unity of the general and the particular becomes the fourth. (*Enc.* §248A, 30)[3]

The various parts and relations can be distinguished by the respective roles of their inner and outer centers. Ideal centers are initially derived from extended objects whose analysis gives the metaphysical basis for heaviness and gravity. The role of the centers is progressed to more reality by having or being centers in or for others. The underlying relational metaphysics allows direct contact to be made with philosophical notions of identity and the Hegelian "being-for-itself" (*Sein-für-Sich*) and "being-for-other"

[3] "Es existiert in der Natur die Totalität der Disjunktion des Begriffs als Vierheit darum, weil das Erste die Allgemeinheit als solche ist, das Zweite oder der Unterschied aber in der Natur selbst als ein Gedoppeltes erscheint, indem in der Natur das Andere für sich als Anderes existieren muß, so daß die subjektive Einheit der Allgemeinheit und Besonderheit das Vierte ist."

(*Sein-für-Andere*). The quaternity of the sun, comet-moon, and Earth is widely used in the text to both explain mutual relationships, but in Hegel's own objective it does more. As the underlying subsystem on which things are built – the necessary reality of concepts that is at the foundation of all higher steps – it is of central importance, going far beyond the immediate application to mechanics.[4]

### *8.2.1 From Space and Time to Heavy Matter*

Right before delving into the discussion of mechanics, Hegel distills the notions of matter and movement from space and time or rather the oscillation between these aspects or dimensions of space-time.

> This passing away and regeneration of space into time and time into space, namely that time posits itself spatially as a locus, but this indifferent spatiality being equally directly temporally posited, is movement. – This becoming is, however, just as much the internal collapse of its contradiction, the directly identically existing unity of both, matter. (*Enc.* §261, 56)[5]

Hegel establishes matter directly from time and space by progressing from locus (*Ort*), the unity of here and now ("Die Einheit von Hier und Jetzt, §260Z, 56) – which can be called a space-time point in the analysis of Kaufmann and Yeomans (2023) – to movement, which incorporates the possibility to change places and represents the ideal aspect of *Werden*, becoming, and finally matter as the dialectic unity which encapsulates this striving and its opposite, that of collapsing differences. This gives matter its metaphysical foundation, namely, "that matter is the reality of time and space, . . . that matter is their truth" ("daß die Materie das Reale an Raum und Zeit ist . . . daß die Materie ihre Wahrheit ist") (*Enc.* §261A, 60).

The next step, transitioning to a multitude of matter that agglomerates to a body, is parallel to the development of space-time in the previous section by starting from a negation and in the Hegelian dialectic lifting it by resolving it into moments. The two opposing aspects are the identity, given by the homogeneity and continuity of matter, and plurality, given by its separation, whose moments are attraction and repulsion. The negative

[4] For instance, in the discussion on "Form" the solar system is referenced as the organizing principle (*Enc.* §353A, 483). (In the solar system sensibility corresponds to the sun, the differentiated are comet and moon and the reproduction is the planet.)

[5] "Dies Vergehen und Sichwiedererzeugen des Raums in Zeit und der Zeit in Raum, daß die Zeit sich räumlich als Ort, aber diese gleichgültige Räumlichkeit ebenso unmittelbar zeitlich gesetzt wird, ist die Bewegung. – Dies Werden ist aber selbst ebensosehr das in sich zusammenfallen seines Widerspruchs, die unmittelbar identische daseiende Einheit beider, die Materie."

unity of these two opposing forces is what constitutes heaviness (*Schwere*) and gives an ideal center (*Mittelpunkt*). Heavy matter is thus a system of many, a body, with an ideal center:

> Matter is the form in which the being-exterior-to-itself of nature transitions to the first being-in-itself, the abstract being-for-itself, the exclusion, which is thereby a multitude, whose unit, the many being-for-itselfs collected into a general being-for-itself, is both an inner part of and exterior to matter –- heaviness. (*Enc.* §252, 38)[6]

Extended matter can fill space and thus make it real, though not yet fully real as ideal aspects remain; the form is not material yet. The formlessness of matter at this stage is reflected in the fact that the center of mass is an ideal point expressing an aspiration of unity which is suspended since "if matter were to achieve what it seeks in heaviness, it would shrivel into one point" (§262A, 63). Not only does it lack reality but even ideal unity (*der Begriff des Begrifflosen*). This deficit will only be lifted in the chapter on physics in the form of light ("erst im Licht kommt es, . . . zur Existenz dieser Einheit für sich", §262A, 63). This provides an inner structure of matter, albeit not fully developed, comprising centers. Given this aspect, one can advance to the next level, where matter with this inner structure is considered within an external environment and reanalyzed in terms of movement.

### *8.2.2 Inert Matter, Collision*

The first quality of matter as a quantity of mass is that it can fill space and time and as such is inert. This is a consequence of the fivefold unfolding of space (Kaufmann et al. 2021), which results in enclosed space bounded by a surface (*Oberfläche*). "Masses which in the superficial determination as a whole or one are bodies" ("Massen, welche in der oberflächlichen Bestimmung eines Ganzen oder Eins Körper sind") (*Enc.* §263, 64). Similarly, the dimensionality of matter fills time in the sense of duration, past-present, and now. This is an external filling made possible by the inner synthesis of movement into matter. It is not yet an external movement. To the contrary, the fact that matter is the unity of rest and movement is what constitutes its inertia, which is the resistance to change

[6] "Die Materie ist die Form, in welcher das Außersichsein der Natur zu ihrem ersten Insichsein kommt, dem abstrakten Fürsichsein, das ausschließend und damit eine Vielheit ist, welche ihre Einheit, als das fürsichseiende Viele in ein allgemeines Fürsichsein zusammenfassend, in sich zugleich und noch außer sich hat, – die Schwere."

of either rest or movement. This resistance is thought of as being on a conceptual level and results from a derealization (*aufgehobene Realität*) rendering inertia an abstract quality. The internality versus externality of concepts is tied to freedom and infinity versus finiteness. As a whole, matter is finite and not free and is therefore inert and can only be moved by exterior causes. This is precisely the point where Hegel differs from the usual terminology of free bodies. One body is finite not free for Hegel and consequentially there is no free motion in the usual sense. Freedom will only come in Absolute Mechanics, where it is realized as a system with a central body and an elliptical orbiter.

As it is not possible to realize movement with one body it must be relative to at least one other body. For two such pari passu bodies, as a system of many, the previous analysis applies: They have a common center and heaviness. This achieves relative movement and provides a version of momentum: "The magnitude of movement is determined by these two moments: mass and the determination of movement as speed" ("Die Größe seiner Bewegung ist bestimmt durch diese beiden Momente: die Masse und die Bestimmtheit jener Bewegung als Geschwindigkeit") (*Enc.* §265, 69). This innocuous comment and the examples provided in this passage again illustrate Hegel's main assertion about composite magnitudes. There is only one fundamental magnitude, what we call momentum today. This is what has impact or action. One can disentangle velocity and mass as factors in $p = mv$, but this is a secondary structure, moments in Hegelian terms, and for Hegel is not the truth of the matter. Velocity is only the ideal relationship of space and time. Jokingly he summarizes this as a man is not killed by the mass of a brick alone but by its momentum, which it attains in combination with speed, which means that he is killed by time and space.[7]

The possibility of elastic and inelastic collision is equally tied to the lower or inner structures. Matter comprises both attraction and repulsion and is thus shape-retaining and deformable at the same time – not by coincidence but by constitutionality as a system of many with an ideal center occupying space. As a whole continuity, a body is hard, occupying the space enclosed by its surface, its extensive oneness being due to attraction. The elasticity is the intensive oneness, the repulsion, that is, the resistive repulsion of a deformation of its structure.

[7] "A brick by itself does not kill a person, its effect (*Wirkung*) is only attained via its speed, that is the person is killed by space and time" (*Enc.* §261, 57).

### *8.2.3 Fall*

The dialectic synthesis of inert mass and collision is fall. Note that this is free fall in modern terminology, but for Hegel it is important that this is not yet a free motion but only a step in this direction, a relatively free motion. The difference between relative movement and fall is codified in terms of centers. In collision, there is a common center for both bodies toward which both strive. In fall, one body, the falling body, puts the center of its striving into the center of the central body. The fact that such centers exist is elevated to an organizing principle: "All masses belong to such centers and every single mass is dependent" (*Enc.* §266A, 72). What is brought in from collision is that it is possible to have the center, the relative center, outside of the ideal center of mass of the body itself. Going beyond this: "Every body has a center of mass as to have as a center its center in the another" (*Enc.* §266A, 72). This sets up a subject–object relation for where the subject is a mass that has a center in itself, the central body, and an object which has its center in the central body. The striving of heaviness (*Schwere*) is now toward that center and the relative ideal center is identified with an ideal center of mass of a central body which imbues reality to that center. This move concludes part B of the Mechanics section via the dialectic synthesis of relative motion and ideal centers of mass into the relative-free motion of falling. It is free, as the concept of motion is a manifestation of heaviness itself. It is only relatively free, in Hegel's account, as there is an ambiguity in the distance to its center. There is still a further deficiency in the concept of a falling body due to its lack of dimensional representation: "The finitude of a body of not being commensurate with its concept, manifests itself in this sphere as the fact that as matter it is only the immediate unity of time and space, but not the developed, agitated unity, movement posited in it as an immanent feature" (*Enc.* §264, 64).[8] The relatively free motion is, however, essential (*wesentlich*), contrary to the accidental motion resulting from throwing an object. Hegel uses projectile motion to contrast the two components of the motion, again illustrating his point of view that the decomposition of the two motions as superimposed on an equal footing, although mathematically sensible is metaphysically not tenable. One of the components, fall, is commensurate with the concept as striving toward a center. The

[8] "Die Endlichkeit des Körpers, seinem Begriffe nicht gemäß zu sein, besteht in dieser Sphäre darin, daß er als Materie nur die unmittelbare Einheit der Zeit und des Raums, nicht aber in einem deren entwickelte, unruhige Einheit, die Bewegung als immanent an ihm gesetzt ist."

accidental part of the straight-line motion is not real for Hegel, it is merely a construct that cannot appear separately and moreover only exists under assumptions, such as no friction and no interference, that are never realized.[9] Hegel's presentation stresses that both the gravitational and the inert mass entering into projectile motion are the same realized concept of heaviness which manifests itself essentially only in fall.

### *8.2.4 Hegel and Kant*

Hegel's exposition up to this point is in close contact with Kant's account in the *Metaphysische Anfangsgründe der Naturwissenschaft* but rearranges the hierarchy in Kant's phoronomy and dynamics. For Kant, matter is the moveable in space (*MFNS* Erklärung 1), which according to Hegel is not wrong but premature and conflates the levels of space, time, space-time, movement, and matter (*Enc.* §262). Abstracting away from the inner structure, Kant obtains his phoronomy which privileges straight-line motion of uniform speed. This is the movement of relative spaces and there is a possibility to switch between bodies in enclosed space and movement of the containing space (*MFNS* Grundsatz, 487). This is what allows the definition of addition or superposition of movements (*MFNS* Lehrsatz, 490). Hegel, in contrast, judges that as premature or at the wrong level. It is not space or bodies that move; time and space combine to give the concept of movement – what moves is matter, not space. The centers to which Kant switches the frame are given by extended matter. The idea of moving enclosed spaces and superposition is to Hegel the ruse of attaching metaphysical meaning to components of a movement of confounding necessary essential movement with accidental movement as in projectile motion. For Kant, phoronomy can be taken as the measure theory of movement, which Hegel denies, again on hierarchical basis, as momentum is the fundamental magnitude. In the second part, dynamics, of the *Anfangsgründe*, matter fills space, as it does for Hegel, but in a different way. For Kant this is a physical homogeneous filling, while for Hegel the first layer is given by a plurality making up a body which has both continuous and polypartite features giving at once repulsion and attraction. Kant has attraction already at the filling level, but repulsion comes later with resistance to penetration, although Kant with hindsight does put it on an equal level with attraction. This is close to the account of

[9] One can argue that such conditions are given in space or in vacuum, but there are always gravitational effects in space and no vacuum is perfect.

elastic and inelastic scattering, which enters at a later stage for Hegel. Repulsion and penetration per se are already built in for Hegel in the first step of heaviness and they are neither space-filling forces nor forces of movement but represent the movement as a synthesis of time and space at a higher level.

### *8.2.5 Absolute Mechanics*

The deficiency of fall to represent true free motion is identified as the mere abstract positing of a center. To obtain a true being-for-itself and hence freeness, the realized movement needs to also contain the moment of repulsion and to lift this self-negation. This is made possible through the movement of a system of many bodies as gravitation:

> Gravitation is the true and determinate concept of material embodiment which has been realized into an idea. The general corporality essentially discerns itself into particular bodies and combines itself into the moment of individuality or subjectivity as an apparent being-present in movement, which is thereby directly a system of several bodies. (*Enc*. §269, 82)[10]

A motion that is free in the sense that it is commensurate with the concept involves the central body and at least one more peripheral body that asymmetrically has its center in the central body. The motion of the peripheral body needs to be a closed periodic orbit to resolve the movements of attraction and repulsion. Although a circular orbit is a tempting alternative, Hegel argues that the correct resolution of the concept realized as an Idee needs a further step, the outcome of which are elliptical orbits. The two main characteristics for this orbit type is that they are closed and that there is a varying distance quantified by the two major axes. This guarantees variation which is equated with an independence from the central body and makes for an absolutely free motion that unifies the two aspects: freedom expressed in the motion through altering the distance and unity with the central body expressed by the closed orbit. In this way, the orbiting body receives an independence and a true relationship with the central body; it is as much true that the ellipse determines its focal points as that the focal points and the half-axes determine an ellipse. This system now represents the concept of matter and movement in its totality

[10] "Die Gravitation ist der wahrhafte und bestimmte Begriff der materiellen Körperlichkeit, der zur Idee realisiert ist. Die allgemeine Körperlichkeit urteilt sich wesentlich in besondere Körper und schließt sich zum Momente der Einzelheit oder Subjektivität als erscheinendes Dasein in der Bewegung zusammen, welche hierdurch unmittelbar ein System mehrerer Körper ist."

and is thus the culmination and tentative logical conclusion of mechanics. There is a valuative metaphysical observation tied in at this point that has great reach with immense explanatory power and promise. The planets choose to "posit their unity in another outside of themselves" (*Enc.* §269A, 84) thus differentiating them from stars and being pure subjects, and in their freedom and as subject-objects attain the highest position; "as the immediately concrete most perfect in their existence" (*Enc.* §269A, 84). This is where true freedom lies for Hegel, which in the mechanical sphere manifests itself as free motion. It is important that the moments of attraction and repulsion, subject and object, continuity and plurality are all contained and unified in one motion representing a concretely realized concept. The only open point at this stage is the choice of one focal point and the actual rules for the motion through the ellipse. This former as a concept is the locus (*Ort*) of the center of the central body and the latter is determined by dimensionality.

In the ladder system of steps or spheres, the dimensionality of time and space must also find its truth as an idea in the different aspects of mechanical movement. In the lower sphere of space, its unfolding is depicted through a four-step inclusion dimensionality: point-line-plane-space, culminating in a capstone of totality reached by the space enclosed by a surface. This dimensionality, along with the three-dimensionality of time (past-present-future or line-direction-point), constitutes an essential aspect (cf. Kaufmann and Yeomans 2023). At the next higher level, this concept needs to be present as an idea and discernible as realized. Spatially, there are three primary steps, plus an additional one, for elliptical orbits (see e.g., *Enc.* §§268, 269A). These steps correspond to the inclusion dimension of point-line-plane, initially halting at two-dimensionality and then culminating with the enclosed area by a curve. This falls short of the full three-dimensionality of space, which is realized through elliptical orbits. This allows Hegel to tie all of Kepler's laws to the concept of space-time in its unfolding dimensionalities,[11] thereby realizing the ideal concepts as truths, by an expression in terms of powers (*Potenz*) of space and time. Power is Hegel's own terminology that explicitly includes both the facets of faculty of directing or influencing and the mathematical term as an ideal expression of this ("The true concepts of other mathematical

[11] The version of Kepler's laws found Hegel's footnotes are: (1) Planets move on ellipses whose one focal point is the sun; (2) the distance planet–sun (radius vector) sweeps out equal areas in equal times; and (3) the squares of the obit periods of two planets is proportional to the third powers of their major axes.

determinations, like the infinite, . . . powers, etc., lie in philosophy" [*Enc.* §259A, 55]). The powers are fundamentally what relates the different steps in the hierarchy that ascends from space and time to the biological and even spirit (*Geist*) (*Enc.* §252, 39). Using this power analysis, the first step from space-time via matter to bodies and celestial motion is accomplished in an inherent way.

The progression is as follows. In the dimension-zero section, point is realized as the locus (*Ort*) which is occupied by the body together with its point-like center. The pertinent concept is heaviness (*Schwere*), this is the general or monas in the move from monas to quintas laid out in §248A. Its manifestation in the solar system is the central body. The next dimension, corresponding to duas, is given by diremption, that is, two bodies with attraction and repulsion. The opposition is given by collision and the concept of relative heaviness (*relative Schwere*). Geometrically, this is at the level of two points with the inherent feature that they define a line and have a common center on that line. The dialectical synthesis is given by fall, the relatively free motion that physically realizes the geometric line as a trajectory yielding a further reality. Hegel's argument roots this one level deeper in the fact that, in nature, there are always several particularities, and this necessarily establishes a common center. In this step, time becomes relevant as the physical realization involves actual motion. In Hegel's dimensional analysis of fall, that is, constant acceleration, he finds space, not time, unfolded to the second power in a somewhat ad hoc way by arguing that here time is merely a unit and hence presents only one dimension, while the second power in $s \propto t^2$ signifies an additional difference as a being apart and thus pertains to space (*Enc.* §267). This is noteworthy as there is a unital argument that gets entwined with a mere power count. Time being the unit of the relation is commensurate with previously developed results in the section on time and space. Indeed, time as negation is the agent of discretization and is in the position which in Hegel's theory of fractions is the unit (*Enc.* §267, 78).

In the absolute mechanics, the two-dimensionality is more clearly realized by quadratic curves, that is, conic sections, qua the second powers in their equations. This is an intrinsically realized manifestation of two-dimensionality, as previously established in *Enc.* §256. The capstone-enclosing feature forces the trajectories to be closed. At this stage a circular motion would give a satisfactory answer, but this does not capture the full freedom of the concept of motion as a circular motion does not exhibit the freedom of movement as variation in the orbiting body. The choices would be an accelerated and retarded motion which Hegel rejects on logical grounds as there is only one degree of freedom in fixing a circle: its radius.

Moreover, the circular motion is the full unity of the three dimensions of time past-present-future (*Enc.* §261A, 59) and thus not unfolded. To overcome this, Hegel argues, one needs to transition to the ellipse, which solves several problems at once. Due to its shape, there is a variation in radius and there is a new degree of freedom, the ratio of the major axes, which further produces a time asymmetry in the orbit.

> In free motion, however, where spatial and temporal determinations intersect in disparity, a qualitative relationship emerges. This relationship necessarily manifests in space as a difference, requiring two determinations. Therefore, the form of the closed trajectory becomes essentially an ellipse (*Enc.* §270A, 91–92).[12]

This gives a concept to Kepler's first law by singling out ellipses from conic sections with the central body as a focal point. This is an important concern to Hegel as he notes that Laplace rightly points out that proceeding in Newtonian fashion, the possible trajectory could be any conic section (*Enc.* §270, 99). The second law is founded in the determination of the two spatial dimensions of a curvilinear motion as area of a sector ("in this way a two-dimensional determination of space arises, the sector" [*Enc.* §270, 92]) now also measured by time. The third law then develops space into dimension three via the third power of the major axes and time into dimension two via the square. This expresses that time is used twice as a unit: first for the motion and then a second time to compare the periods. There is a deficiency as time is not expanded to the third dimension, which Hegel explains by the fact that time is only developed into the "formal identity with itself" (*Enc.* §270, 93). Time is not yet free at this stage, it is only "light the ideality liberated from heaviness, [that is] a free time" (*Enc.* §351, 431). Kepler's third law is thus the perfection being commensurate with the internal dimensions of space and time and their relation in matter and motion as developed so far. It is the sense or reasonableness of the subject matter ("Vernunft der Sache" [*Enc.* §351, 431]).

### *8.2.6 Relation to Newton, Classical Mechanics, and Modern Examples*

In his critique of Newton, Hegel is not rejecting his views and contributions outright but is emphasizing that their explications lack a refined

[12] "In der freien Bewegung aber, wo räumliche und zeitliche Bestimmung in Verschiedenheit, in ein qualitatives Verhältnis zueinander treten, tritt notwendig dies Verhältnis an dem Räumlichen selbst als eine Differenz desselben hervor welche hiermit zwei Bestimmungen erfordert. Dadurch wird die Gestalt der in sich zurückgehenden Bahn wesentlich eine Ellipse."

hierarchy that stratifies the phenomena into accidental (*zufällig*) or necessary (*notwendig*). With a more sophisticated approach, Hegel aims to disentangle a democracy of cacophony of proliferated forces (e.g., "diesen Staat von Kräften können wir jedoch entbehren" [we can dispense with this conglomerate of forces] [*Enc.* §265, 68]) into those concepts that are essential – tied to space, time, and matter – and those simply having mathematical convenience.[13] In several passages, Hegel expressly does not disqualify the mathematical convenience of Newton's approach or that of forces but does contend that it obscures the actually existing or ideally founded from the merely formal (e.g., *Enc.* §266, 70; §270, 88). Forces, although conducive to mathematical calculations, are neither empirical nor fundamental quantities and therefore cannot be used to grasp the true character (*Wesen*) of matter. The reality (*Wirklichkeit*) of movement is tied to action or effect (*Wirkung*).[14]

The main equation in Newtonian physics is the famous F = ma. In the absence of forces F = 0 and hence a = 0, which means no acceleration. Commonly this is called free motion, a name that Hegel takes issue with, which is in a straight line with constant speed. The conserved momentum p = mv associated to this motion is given by inertial mass. For Hegel, inertial mass as a concept is not given by free motion, but the logic is reversed. Mass, or rather heaviness, is the first concept and momentum is secondary, observed only in collision. A modern argument to Hegel's point is that by changing the frame of reference one can simply make any free motion to have velocity 0 and hence the mass would not be visible as the momentum and would vanish, showing that rest and movement are frame dependent. Hegel instead argues on a metaphysical level in attributing a concept to heaviness; that of having or striving toward a center. Furthermore, in the modeling of the motion of a solid body it is replaced by a point particle with the total mass. The metaphysical conundrums that are not answered by this, and that Hegel's concept addresses, are that point particles only have a mysterious "infinitesimal" mass, a limit density, and as such the total mass given by the integral of the mass density, the region, that is, the form, must be specified as an antecedent input.

Hegel and modern physics are in accord in the treatment of collision. The momentum and the inertial mass are only measurable through

[13] The paradigm here is the usual vector addition of forces using the familiar parallelogram, which inversely allows to decompose any force into a sum, where one of the summands is a free choice. This ambiguity is what Hegel's argument runs counter to.

[14] Not coincidentally both *Wirkung* and *Wirklichkeit* have a common root with the English "work."

scattering, that is, in a two-body system with the total conserved momentum governing the process. The independent quantity under a change of reference frame, which can be used to transform the total momentum to zero, is the relative moment.

In Newton's theory, for both fall and planets, the law of gravitation with the force $F = G\frac{Mm}{r^2}$ is used. For fall M is the mass of the earth, so that GM is constant, and r can be approximated by the radius $r_E$ of the Earth, resulting in F = mg with $g = GM/r_E^2$. Inserting into F = ma = mg mass cancels out using the now necessary identification "inertial mass is gravitational mass." This yields a = g, which does not involve forces and is Hegel's starting point, a uniformly accelerated motion. The approximation of r by the radius of Earth is only possible if one of the masses, that of the central body, is much larger than the other; this is Hegel's external center. The Kepler problem, that is, an inverse square law in three dimensions, has conic sections as solutions. Which conic section is realized depends on the initial conditions, initial position, and initial velocity; an unsatisfactory state of affairs for Hegel.[15] The derivation of the equations of motion further uses a parallelogram of forces to decompose the acceleration into tangent (free) and normal (fall) directions. Hegel is not against this computation as a tool but strongly objects to any metaphysical relevance of this construction. There is only one, albeit asymmetric, relationship between the two bodies realized in gravitational motion representing true freedom.

One modern approach involves the utilization of conserved quantities. In addition to the conservation of energy and total momentum, angular momentum is also preserved, resulting in planarity. There is a second conserved quantity the Runge–Lenz vector, which can be shown to be equivalent to Kepler's third law. These conserved quantities, or integrals of motion, in lieu of differential equations of motion could be understood as a modern version of the totality of the concepts that Hegel is looking for. The systematic construct of matter and movement as the synthesis of time and space is reflected today in particle–wave duality, which equates point particles with oscillations, as well as in the fluctuating vacuum in which energy oscillations are possible and pairs of virtual particles are created spontaneously as emergent matter. The organizing principle of centers and their relations is present in everything from atoms to galaxies whose centers are now taken to be black holes. Fixing dimensions of space-time is a major part of string theory, but the core space-time is still fixed to be that of

[15] Hegel ridicules this point of view: "In this fashion boys hit a ball with a club, . . . We do not think it proper to apply such boyishness to free motion" (*Enc.* §270A, 97).

three-space and time. That mass is a formative constituent of the shape of this space-time is what is the basis of general relativity. All these examples are much closer to Hegel's view than to a strict Newtonian one.

### *8.2.7 The Transition to a System of Four: The Sun-Moon-Earth and Sun-Comets-Earth-Moon Systems*

Although the dimensional analysis yields a raison d'être for Kepler's laws, there are several issues that are not totally brought out in the concept of a two-body central potential system from the point of view of logic and nature. The center of the central body is only ideal, the planets are not fully subject-objects yet (logically there should be a system of three – general, particular, and individual), and finally the particular should be doubled in nature. There is a progression of three constellations that Hegel offers to resolve the situation which culminates in the quaternity sun, comets-moon, planet, specifically Earth, which furnishes the model for all further processes: "The solar, planetary, lunar and cometary nature will be traced through all following steps of nature; the gaining of depth of nature is only a continuing reshaping of these four."[16] The exact arguments are worthy of a separate chapter, but we will give the broad strokes. To make its center real to itself, the central body should have some movement about it. But as it is in the perfect general position this movement can only be a stationary movement (*ruhende Bewegung*).[17] This is possible as a rotation about an axis, which the sun does exhibit. This has a second ramification in that the planets can also possess this type of rotation, thereby making their centers real. This is a first step into the individuality of the planets, speaking in terms of Hegel's logic. The planets have both a center in themselves, through rotation, and a center outside of themselves by orbiting the central body, thus exhibiting a being-for-themselves and a being-other,[18] but not yet a being-for-another, which at this stage only the central body evinces. The full subject-object is only achieved in a tripartite system, when the moon is added, as witnessing the difference between the central body and the orbiting planet. As the moon now orbits earth, it

[16] "Die solarische, planetarische, lunarische, kometarische Natur werden wir durch alle folgenden Stufen der Natur verfolgen; die Vertiefung der Natur ist nur die fortschreitende Umbildung dieser Vier."

[17] This type of stationary movement can already be found in Plato Nomoi (893c5) "that those which have the quality of being at rest at the center move in one location, as when the circumference of circles that are said to stand still revolves?"

[18] On the central concept of being-other, see Ferrini 2020.

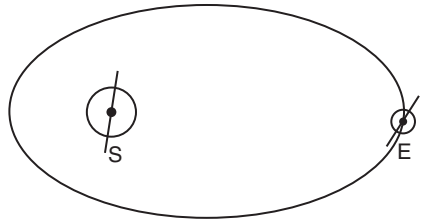


Figure 8.1 The sun-earth system with independent rotation axes

becomes a center outside of the moon and hence a being-for-others. Logically, the situation is now squared with the sun as the general, the moon as the particular, and earth as the individual. In nature, however, there should be a doubled particular. This role is taken over by the comets, which even Hegel finds in need of explanation ("It may seem odd to try fit the comets into this; but what is present, must necessarily be contained in the concept" [*Enc.* §270A, 104]). He offers two interlinked ways of explanation. The first is through the two aspects of the rotational movement of the sun being stationary and excessive (*ausschweifend*), which are represented by the moon and comet, respectively. The excessiveness is a manifestation of the agitation (*Unruhe*) underlying the time-space oscillation and as a vortex (*Wirbel*) the being-ready-for-action (*Auf-dem-Sprunge-Stehen*, Figure 8.1). In terms of centers, we now have the sun with a center for itself and a center for others; the comet, which has a center in the central body; and the moon, which has a center in the earth, which is not central but now has a center in another and is a center for another (Figure 8.2). This is a powerful relational system which is used throughout the text. Two notable explanations on this basis of four already provided in this section are the description of the functionaries of a state (*Enc.* §297A) and the processes of the body (*Enc.* §270A). In terms of the realization of space-time, this system is also more complete as the different types of movements are now embodied and with them the dimensions of time and space, with the comet standing for the future and the moon for the past (*Enc.* §270A). The next step, which is outside the realm of the "Mechanics," is to add an internal dynamic, which is provided in "Physics" by using the system of four to model transitions.

## 8.3 Conclusion

The Hegelian treatment of mechanics is a thought-provoking excursion into metaphysical questions which still have importance today. Although

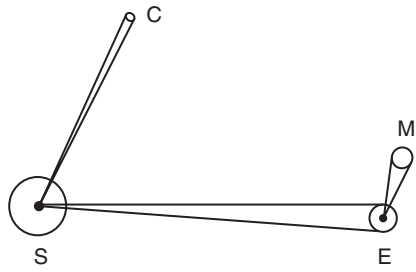


Figure 8.2 The full sun-comet-earth-moon system with its centers

critics may see Hegel's treatment of mechanics as an idiosyncratic way of presenting celestial mechanics solely designed to bring it in line with his dialectic, and in this way rather obscuring than illuminating science, it calls out the desirability of foundations beyond elegance in formalism and computational applicability and offers fascinating examples of deeper concepts. Intra-systematic, the complex constructs can be used to illuminate parts of Hegel's *Logic* by providing examples, but for his *Science of Nature* the space-time-movement-matter embodiment of the quaternity in terms of the solar system is foundational and serves as a Rosetta stone, with all ensuing processes and the respective elements being built on it.

CHAPTER 9

# *Logic and Physics in Hegel's Philosophy of Nature*

*Stephen Houlgate*

## 9.1 Philosophy, Science, and Experience

Hegel's philosophy of nature has frequently been subjected to critique during the last two centuries. Karl Popper described Hegel's remarks on sound as "gibberish" (Popper 1966, 2:28), and Matthias Schleiden dismissed his "strange formulas" as "completely unfruitful for the natural sciences" (Schleiden 1988, 61, 81). Schleiden's critique suggests that the value of a philosophy of nature consists in furthering science. This, however, is not Hegel's aim, but he provides a distinctively *philosophical* account of nature. He is critical of what he regards as the unwarranted "metaphysical" assumptions underlying some scientific theories, and in that sense, he seeks to reform science (see, e.g., *Enc.* §334R [265]).[1] Yet his principal aim is to show that nature is governed, not just by scientific laws, but also by *reason* as philosophy conceives it (see *GW* 24, 1: 296).

Nature, however, is the object of our everyday (and scientific) experience. Hegel must show, therefore, that there is reason in what *experience* reveals nature to be. Indeed, he insists, "accord with actuality and experience is [. . .] an outward touchstone, at least, for the truth of a philosophy" (*Enc.* §6). Schleiden quotes this passage in his book on Schelling and Hegel but accuses the latter of "the crudest empirical ignorance" (Schleiden 1988, 60). This accusation, however, is unjustified: For Hegel had a large collection of scientific texts in his private library (see Neuser 1987a), and he makes copious references to the work of scientists, such as Galileo, Kepler, Herschel, and Davy, in his *Encyclopaedia* and lectures on the philosophy of nature.

For Hegel, both science and philosophy must make sense of what is *observed*. Yet he recognizes that empirical perceptions and observations are informed by categories of thought (see *Enc.* §420 & R). Furthermore, he

[1] Page numbers in square brackets refer to *Enc.* 2.

notes, an empirical phenomenon is "capable of various categories" (*Enc.* §304R). It can be conceived through categories of the understanding (as occurs, for the most part, in science) or those of speculative reason (as in Hegel's philosophy of nature). The understanding presupposes that there are sharp distinctions between categories such as "form" and "matter." Reason, on the other hand – as we learn in Hegel's logic – discerns the *dialectic* in such categories through which they turn into their opposites or prove in other ways to be tied to their negations (see *SL* 10, and *Enc.* §§80–82). Hegel conceives of nature through such dialectical categories of reason.

Note, however, that there is a subtle difference between the categories examined in Hegel's logic and those employed in his philosophy of nature: The latter are derived from and incorporate the former but they are not reducible to them. This difference between the two sets of categories has its ground in the transition from logic to the philosophy of nature in Hegel's system.

## 9.2 From Logic to Nature

Hegel's logic examines categories that belong to both thought *and* being. It is thus not only a logic but also an ontology: It constitutes "metaphysics proper or pure speculative philosophy" (*SL* 9; see Houlgate 2022, 1: 114).

Such logic begins with pure being and then demonstrates that being proves to be quality, quantity, essence, and the "concept" (or universality that particularizes and individuates itself). The concept – which is a further form of being, not an "act of the self-conscious understanding" (*SL* 517) – in turn proves to be mechanical and chemical objectivity, then life, and finally the "absolute idea" (*absolute Idee*).

The absolute idea, Hegel writes, is "*being*, imperishable *life*, *self-knowing truth*, and is *all truth*" (*SL* 735). Since it is "*all truth*," however, it is not one form of being among others, like those preceding it in Hegel's logic, but it stretches back and incorporates all the latter within itself. More precisely, Hegel explains, it is the whole series of those forms of being, or categories, conceived as a single process of "self-determination" or self-determining reason (*SL* 735–36). The "true content" of the absolute Idea is thus "the entire system" whose "development" is articulated in speculative logic (*Enc.* §237A). The absolute idea is, indeed, the final determination to emerge in such logic; but this is because it is only at the end of its logical development that being proves to be, not just a series of different categories, but the single systematic "self-movement" that Hegel calls the "absolute idea" (*SL* 736; see Houlgate 2022, 1: 89–91).

Note that being, as absolute idea, does not relate to anything other than itself. It is not *something* in relation to something *else* but pure *self*-determination. In other words, it is "the whole that has withdrawn into itself and is *identical* with itself" (*SL* 747). This means in turn that it is simply and immediately itself and so "has given itself again the form of *immediacy*." At the start of logic, being is "indeterminate immediacy" that has "no difference within it, nor any outwardly" (*SL* 59). At the end of logic, Hegel contends, being, as absolute idea, proves once again to be simple, unrelated immediacy. "Logic," he writes, "has returned in the absolute idea to this simple unity which is its beginning" – "the *simple relation to itself* [*Beziehung auf sich*] which is *being*" (*SL* 752).[2]

Yet the absolute idea does not revert to the utterly *indeterminate* being with which logic starts, since it incorporates all the categories that have since emerged. It is, rather, internally differentiated being or "*fulfilled* being" (erfülltes *Sein*) (*SL* 752).[3] It is "being as the *concrete* and just as absolutely *intensive* totality." In speculative logic, therefore, being develops from its initial indeterminate immediacy, through the different categories it makes necessary, to the point at which it proves to be a single process of self-determination: the absolute idea. At that point being recovers the simple, self-relating immediacy it first enjoyed but in a new "concrete" form that is the logical *result* of the development it has undergone.

There is, however, an ambiguity in the absolute idea. This ambiguity is not explicitly highlighted by Hegel, but it is evident in a change of emphasis in the last two paragraphs of the *Science of Logic*. In the penultimate paragraph Hegel states that logic has "returned" in the absolute idea to the "simple unity" of being. He insists, however, that such being is "*fulfilled* being" or being as an "*intensive* totality" (*SL* 752), and by emphasizing the words "fulfilled" and "intensive" he indicates that what has emerged is not just pure being but the internally differentiated *idea* in the form of immediacy or being.

In the final paragraph Hegel changes the emphasis and writes that the idea collects itself into "the immediacy of *being*" (*SL* 752). This does not now mean that it reverts to pure being after all. It remains the concrete idea *as* being, as Hegel makes clear by saying that it is in the form of being "as *totality*." Yet, through his change of emphasis, Hegel indicates that the idea is not only the *idea* as being but also the idea as *being*. This change is not arbitrary on Hegel's part but renders explicit what is implicit in the

[2] I have occasionally (as here) amended di Giovanni's translation in *SL*.
[3] Di Giovanni has "fulfilled concept."

absolute idea itself – the fact that the idea, through being wholly self-relating, not only is the systematic unity of all the categories but also constitutes simple *immediacy*, simple *being*. Furthermore, Hegel's change of emphasis has a significant consequence: For, he states, insofar as the idea (or "totality") is in the form of *being*, it is no longer just the idea but *nature*. At the end of Hegel's logic, therefore, being proves not only to be the absolute idea – or rational self-determination – but *in* being the latter also to be nature. Nature in turn is not something other than the absolute idea but (in the words of the *Encyclopaedia*) is itself "the *immediate idea*," "the *idea* as *being*," or "this idea that *is*" (*diese seiende Idee*) (*Enc*. §244 & A).

The transition in Hegel's system from logic to nature has been severely criticized by Schelling among others (see *HMPhA* 153–54), but it is in fact relatively simple: The idea takes the form of nature insofar as it is not just the idea as such but the idea "in the immediacy of *being*." Note, however, that the transition from logic to nature does not take us into the sphere of "being" for the first time in Hegel's system. Hegel writes that the idea as *idea* is "still logical" and is "enclosed [*eingeschlossen*] in pure thought" (*SL* 752), so one might think that the transition to nature takes us from within thought *out* into being. Yet Hegel's logic is the study of thought *and being* throughout its course. In such logic, Hegel states, "being is known to be in itself pure concept and the pure concept to be true being" (*SL* 39), so the transition from logic to nature is in fact the transition from being to being – from being *qua* being and absolute idea to being *qua* nature. What then distinguishes nature from being as it is conceived in speculative logic?

Being in logic takes many forms, culminating in the "idea," but it does not yet take the form of space, time, and matter (and is intelligible without reference to the latter). So "becoming," for example, is not becoming in *time* but simply the vanishing of being and nothing into one another (*SL* 60). All such forms of being are thus purely onto*logical*, rather than spatio-temporal, structures (and in that sense remain "enclosed" in pure thought). Nature, by contrast, is being as "the *externality of space and time*" (and as matter in space-time). What now needs to be explained, therefore, is why the absolute idea, in "collecting itself" into "the immediacy of *being*," also takes the form of "*externality*" (*SL* 751–52).

Note first that, *pace* John Burbidge, nature is not something external to, and other than, the idea (see *Enc*. §247; Burbidge 1996, 205–6; Houlgate 2002–3, 111). It is, rather, a further form *of* the idea, and the latter consequently remains visible *in* nature; or, as Hegel puts it, "the simple being" – nature – "to which the idea determines itself remains perfectly transparent to it" (*SL* 752). The idea, therefore, does not pass over, or

change, *into* nature, but it "*freely releases* itself" (*sich selbst frei entläßt*) *as* nature, or discloses itself *to be* nature (*SL* 753).

Such "release" of itself is "free" because the idea proves to be nature through itself alone – through *being what it is* – and remains itself in the process: In Hegel's words, it remains thereby "absolutely certain of itself and internally at rest." Yet there is a further aspect to the idea's freedom that needs to be highlighted: For in freely *releasing* itself, the idea lets itself *go free*, and this in turn means that it lets itself *be* free in its immediacy. It is this aspect of the idea that explains why it takes the form of "externality" or *nature*. As Hegel writes, "on account of this freedom, the *form of its* [the idea's] *determinateness* is just as absolutely free: the *externality of space and time* absolutely existing for itself without subjectivity" (*SL* 753).

More precisely, the idea as *being* takes the form of externality because it is in two respects free *of* the form of the idea as such. The idea *qua idea* comprises the "system *of the logical*" conceived as the self-determining of being (*Enc*. §§237–38). It is thus (1) the logical interconnectedness of all the categories in logic but (2) conceived as a "whole" that is "*identical* with itself" or a "simple unity" (*SL* 747, 752). As this unity the idea is the "*simple relation to itself* which is *being*"; yet initially – before (logically) it proves to be nature – it retains its character as idea and so is the *idea* as being. It is thus what Hegel calls "*fulfilled* being" (*SL* 752). In "collecting" itself into the "immediacy of *being*," however, the idea releases itself as nature – the idea as *being* – and in so doing releases itself *from itself as idea*. It thus releases itself (1) from being the logical interconnectedness of the categories and (2) from being an explicit unity. Nature remains a further form of the idea and so remains a "*totality*" (*SL* 752) encompassing different moments; yet such moments are no longer logically interconnected and so must be *external* to one another. Furthermore, they no longer constitute an explicit unity and so must lack the moment of "subjectivity," or self-determining unity, that characterizes the idea as such. The idea as nature must, therefore, be "*externality*" existing for itself "without subjectivity" – an externality that, in the philosophy of nature, Hegel identifies with space (*SL* 753). (Such externality, by the way, does not lack continuity, since it is initially understood as "the abstract *universality*" of its "*self-externality*" [*Enc*. §254], but it lacks the explicit systematic unity of the idea.)

The externality of nature is thus made necessary by the fact that the idea "*freely releases* itself" *as* nature and thereby releases itself, or sets itself free, *from* itself as idea. The idea in the form of nature is, therefore, the "negative of itself" (*Enc*. §247) – the idea that is no longer the "intensive"

unity of logically interconnected moments. Yet nature remains the idea, albeit the idea as *being* rather than the *idea* as being. Nature is thus not something *other* than the idea. It is not a separate realm of being distinct from the sphere of the "logical," but what the idea *itself* proves to be. Nature, in other words, is the idea itself in a form that is not that of the idea as such, and so is "the idea in the form of *otherness*" (*Enc*. §247; see also §18; in addition, see Bormann 2000, 36).

Since nature is not something *other* than, and separate from, the idea, the idea does not *precede* nature in time – despite Hegel's claim that logic is the "exposition of God" as he is "before the creation of nature and a finite spirit" (*SL* 29). For Hegel, "nature is the first in point of time," even though "the absolute *prius* is the idea" (*Enc*. §248A [19]). The idea precedes nature *logically*, since logically being proves first to be the idea. Yet the idea itself proves, through its own logic, not just to be the idea but to be *nature*. The idea, therefore, is in truth nothing less than, and nothing beyond, nature, and so is what Spinoza would call the "immanent cause" of nature (see Spinoza 1994, 100 [*Ethics* IP18]; Houlgate 2005, 109).

Since, however, nature is the "idea in the form of *otherness*" – of (self-) externality – the idea is not present in nature as the *idea*, as pure self-determining reason. Nature, therefore, does not exhibit the categories comprising the idea in their purely ontological interconnectedness, but such categories, which Hegel also calls "determinations of the concept," are, more or less, *external* to one another: They display an "*indifferent subsistence* and *isolation* in regard to each other" (*Enc*. §248). Accordingly, they inform different, and in some cases quite separate, natural phenomena. So, for example, in Hegel's philosophical physics, the category of "identity" is exhibited by light, whereas "diversity" (*Verschiedenheit*) and "opposition" (*Entgegensetzung*) are exhibited (in a qualified form) by moons and comets respectively (*Enc*. §§275, 279).[4]

There are, indeed, logical connections between different categories in nature, and the latter thus proves to be "a *system of stages*, one arising necessarily from the other" (*Enc*. §249). Yet this system comprises the categories derived from the idea as *externality*, not just (as in logic) those derived from pure being – categories that remain external to one another even in their logical connection. The categories that govern nature, therefore, are not merely logical but *natural-logical* ones.

[4] I have occasionally (as here) amended Miller's translation in *Enc.* 2. (Miller has "difference" instead of "diversity.")

Since different *phenomena* in nature are also characterized by externality and so are (more or less) external to one another, they are determined, in Hegel's view, not just by the natural-logical categories that inform them but at the same time by other external factors: They are vulnerable to "determination from without" (*Enc.* §250). Such factors, as *external* to things, are not derivable from the categories that otherwise make things what they are. From the perspective of the philosophy of nature, therefore, these external factors determining natural phenomena are contingent. They are perhaps explicable by science but not by philosophical reason. The latter is thus limited in what it can do: It can determine the categories made necessary by the idea as externality, but "it is quite improper to expect the concept to comprehend [. . .] contingent products of nature" (*Enc.* §250R).

Nature, therefore, is not governed by the idea alone and so is not purely rational. For philosophy, it is marked by contingency (or the "unreason of externality" [*Enc.* §248R]), as well as by reason; and the reason that does in part govern it is that which is inherent in externality (or self-externality), not just pure being. "This," Hegel writes, "is the *impotence* of nature, that it preserves the determinations of the concept only *abstractly*" – as in some respect external to one another – "and leaves their detailed specification to external determination" (*Enc.* §250).

The idea, therefore, does not exhaust the realm of nature it constitutes but turns itself into a *moment* of the latter – the moment of rational necessity that coexists with contingency (*Enc.* §§248, 250). Moreover, the idea as such – as *ontological* – does not exhaust even the moment of *reason* in nature, since the latter is the idea in the "form of externality" (*Enc.* §248R). The self-determining reason or "idea" that philosophy discerns in nature incorporates that which emerges in logic,[5] but it is not reducible to the latter.

## 9.3 The Task and Method of Hegel's Philosophy of Nature

In speculative logic several categories (or ways of being) contain the moment of externality, including "external reflection" and "mechanism," yet they remain ontological categories conceived by pure thought. Nature, however, is the idea as utter (self-)externality, and as such not only has a rational structure discernible by thought but also affects us *externally*

[5] Except for the "idea of cognition," which prefigures the realm of "spirit" (see *SL* 689–734).

through the senses. Nature, unlike being as the pure idea, is thus the object of our empirical experience.

Accordingly, Hegel has a twofold task in his philosophy of nature: first to derive the categories of nature logically – a priori – from the idea as externality, and then to identify the empirical phenomena that match those categories (see *Enc*. §246R). Hegel provides empirical examples in the *Logic* too, but these are not necessary in speculative logic. They are required in the philosophy of nature, however, because nature is the object of empirical experience as well as of pure thought.

Note, though, that empirical examples may play no role in the derivation of the categories of nature. The latter are derived logically through simply rendering explicit what is implicit in the idea as externality. Hegel's philosophy of nature does not, therefore, "apply" categories from his logic to nature, but it continues the project *of* that logic, starting, where the latter ends, with the idea *as* nature. This is not to deny that discoveries by science may have aided Hegel in working out the relation in which natural-logical categories stand to one another (see Houlgate 2005, 115–17); but in the philosophy of nature itself these categories (or ways of being) must be shown to emerge logically and immanently from sheer externality (see *Enc*. §246).

Empirical phenomena, of course, cannot be derived logically in the same way but must be discovered through observation and experience (including scientific experiments). In his account of light Hegel maintains that "the immanent philosophical element is here, as everywhere, the inherent necessity of the conceptual determination [*Begriffsbestimmung*], which must then be pointed out as *some* natural existence"; but, he insists, the proof that the category of "identity-with-self" exists as *light* must be "conducted empirically" (*Enc*. §276R).

Empirical observation, however, cannot invalidate the logical derivation of nature's categories. This does not mean that this derivation, as Hegel presents it, is beyond criticism; but if it requires revision, this must be, ultimately, for logical, not empirical, reasons (and Hegel did in fact revise his account of the logic of nature, just as he made changes to the *Logic* in the second edition of the doctrine of being).[6] If, therefore, a given natural phenomenon turns out not to match a natural-logical category that is properly derived, then it is not the category that must be changed but a different phenomenon must be found.

[6] See Burbidge 1996, 96–102 (for changes in Hegel's conception of chemism in successive editions of his *Encyclopaedia*), and Houlgate 2022, 1:400n16. See also Houlgate 2005, 117.

Hegel is unequivocal about this. In his 1823–24 lectures, for example, he says that "self-externality [*Außersichsein*] is the first determination" in our idea of nature, and if we look for "what corresponds to this thought in our representation [*Vorstellung*]" we find space (*GW* 24, 1: 531).[7] He adds, however, that even if space does not match that thought, "this harms nothing in the thought" itself and "the latter remains for that reason true." Similarly, after setting out the "thought-determination of light," Hegel states that "light is the presence [*Vorhandensein*] of the thought," but "if by chance it were not this, the thought would still be correct and something else would have to take the place of light" (*GW* 24, 1: 576–77). In fact, Hegel does not doubt that space and light are the appropriate phenomena in these cases and that his philosophy of nature thus accords "with actuality and experience" (*Enc.* §6). It is clear, however, that, in his view, the immanent derivation of the natural-logical categories comes first, and these categories (or ways of being) are then matched with empirical phenomena.[8]

Note that, for Hegel, the task of philosophy is not to explain all aspects of those phenomena; many aspects, perhaps most, are explained by science (see, e.g., *GW* 24, 1: 293.9–11). Philosophy's task is to show that natural-logical *categories* are made necessary by nature and are embodied *in* various natural phenomena. Its task, in other words, is to show that there is *reason in nature* – reason that science cannot see (or can see only dimly). Such reason, however, does not conflict with the causal processes discovered by science but works through the latter, just as reason in history works "cunningly" through the passions of people to bring about political states that are (more or less) rational and free (see *VHGesch* 105).

Hegel's philosophy of nature thus complements science and does not seek to supplant or discredit it.[9] Indeed, it depends on science, as well as on everyday experience, when matching empirical phenomena to natural-logical categories. This is not to say that Hegel leaves science utterly to its own devices; he is especially critical of the abstract metaphysics he takes to underlie some science (*Enc.* §334R [265]). Yet his aim in the philosophy of nature is not to compete with, or contribute to, science as an empirical discipline. His project is a *philosophical* one: to show that nature exhibits an immanent rationality that only philosophy can articulate.

[7] All translations from Hegel's lectures are my own. Note that, for Hegel, our experience of space is not purely empirical but presupposes the a priori form of spatial intuition (see *Enc.* §448).

[8] See Stone 2005, 4–5, 9–12, 27–28 on "strong apriorism."

[9] For Hegel, whereas philosophy shows that certain natural phenomena conform to reason, empirical science is concerned with their "*modes of origin*" (*Entstehungsweisen*) (see *Enc.* §320R [196]).

Since Hegel's philosophy of nature combines logical development with empirical observation, students of that philosophy are confronted with several different tasks. First, we must determine what is logically necessary in it, that is, what must follow from the idea as sheer (self-)externality. In so doing, we must also establish whether Hegel makes claims that appear to be based on natural-logical categories but are not in fact justified by the latter. Second, we have to distinguish these categories from the empirical phenomena Hegel connects with them. This is not always easy, since sometimes – especially in his lectures – Hegel conflates the two and talks simply of "light" or "air" when he has their *categories* principally in view. This conflation can in turn lead him to make statements that look absurd, such as that air is "passive light" (*GW* 24, 1: 63), even though the phenomena concerned merely share the same "thought-determination" and are not physically the same (*GW* 24, 2: 847). Third, we need to keep in mind that Hegel is interested primarily in the *logical*, not empirical or physical, connections between phenomena. So, for example, he claims that magnetism leads logically, through its corresponding category, to the crystal (and its category), not that the former causes the latter physically (see *Enc.* §§314–15).

Fourth, we need to distinguish any empirical errors on Hegel's part – due to his misjudgment or reliance on the science of his day – from conclusions that follow from the logic of nature itself. Such errors can be corrected without detriment to that logic but only if they are clearly identified as empirical, rather than logical, errors. Fifth, we need to determine whether ideas in Hegel's philosophy of nature that appear to conflict with subsequent developments in science actually do so. In Section 9.6 we consider the apparent conflict between Hegel's conception of light and that of quantum physics; but we must first look more closely at Hegel's own philosophical physics, the second part of his philosophy of nature.

## 9.4 Hegel's Philosophical Physics: From Light to the Elementary Process

The first part of that philosophy – mechanics – begins with "the abstract *universality of nature's self-externality*," which Hegel identifies with space (*Enc.* §254). Through the moments of negation and negativity it contains, space (or self-externality) then makes time, place, motion, and matter necessary (*Enc.* §§257–61). Matter, however, is initially no more than enduring, self-identical space (or "place") that moves (see Winfield 1998, 63–64; Houlgate 2005, 132). It separates itself from, or "repels," other matter (and in that respect is self-external); but it also "attracts," and is

attracted by, other matter (since it is, essentially, continuous in its self-externality), and so *gravitates* toward the latter. For Hegel, therefore, gravity (*Schwere*) is not a force within bodies but simply their inherent motion toward one another. More specifically, it is the movement of a body toward a "*center*" that lies outside it (*Enc.* §262).

Note that matter as mechanical lacks physical characteristics or *qualities*, such as density and cohesion, and is distinguished from other matter by its quantity. Each body is "particularized into different quanta or *masses*" which give it, insofar as it gravitates toward other bodies, a distinctive weight (*Enc.* §§263, 265). Hegel argues, however, that gravitation itself makes it necessary logically that matter have physical qualities. Gravitation does so by first giving rise to a "system of *several bodies*" that contains its "center" within itself (*Enc.* §§269–70).

In this system – which Hegel identifies with the solar system – the bodies remain external to one another; but they form a "*totality*" organized around a central body, which falls within, rather than outside, the self-external matter constituting the system. As Hegel puts it, therefore, in this system "matter is *nothing outside* of this its being-outside-one-another [*Außereinanderseyn*]" (*Enc.* §271, emphasis added). Moreover, the system is not just a collection of massive bodies but it has a differentiated *form* that is determined by the "concept." It comprises a "*universal* center" – the sun – that is surrounded by "centerless *singularity*" in the form of comets and moons, the latter of which orbit *particular* bodies – the planets – that are "centers for themselves" but find their "essential unity" in the "*universal* center" (*Enc.* §270).[10] In the solar system, therefore, form – specifically conceptual form – is "materialized" and matter in turn acquires "determinateness of form" (*Enc.* §271). Furthermore, Hegel argues, since matter has now "resolved itself into form," it is no longer simply "heavy" (*schwer*) and divided into masses that are quantitatively distinct. It is also, at least implicitly, "*qualified matter*"; and when matter is conceived explicitly as having a distinctive form or quality, we enter the sphere of physics.

Two things should be noted about this transition from mechanics to physics. First, it is a logical (or natural-logical) transition, not a strictly natural one. Stars did indeed give birth to the naturally occurring chemical elements (see Cohen 2021, 87), but this is not what Hegel has in mind here. His claim is a logical one: that form is "materialized" in the solar system and the materialization of form becomes fully explicit in physical matter.

[10] On the "concept" as uniting the universal, particular, and singular (or individual), see *SL* 529–49.

Second, the physical qualities of material bodies do not supplant their mechanical properties but constitute a dimension *of* bodies that move and have mass. More specifically, "qualified matter" in its *immediacy* takes the form of "the now physically determined *celestial* bodies" of the solar system, and different physical qualities thereby fall, initially, "outside one another in an *independent* way" (*Enc.* §274, emphasis added).

As explicitly *qualified*, however, matter no longer has its center outside itself in another body but is "reflected" back into itself and has a determinate form within itself. The categories that inform such matter, therefore, are the "determinations of reflection" derived in the doctrine of essence in the *Logic*, namely, identity, diversity, and opposition (see *GW* 24, 3: 1243.25–28, and *SL* 354 ff.; see also Wandschneider 1987, 301). Yet since these categories initially inform bodies that are "*independent*" of one another – despite belonging to one system – they are themselves independent in a more explicit way than is the case in the *Logic*.

Matter in its first qualified state is thus "*pure identity*-with-self" as the "unity of *reflection-into-self*" (*Enc.* §275). As such, it is qualitatively different from heavy matter and so has no mass: it is "*absolutely weightless*" (*Enc.* §276). Hegel identifies such "material ideality," or "immaterial matter" (*Enc.* §276A [93]), with *light* and notes that it is emitted by the sun and other stars – bodies that themselves have mass. He states, however, that "the physical conditions of the solar light do not concern us inasmuch as they are not determinations of the concept, but only matters of empirical fact" (*Enc.* §275A [90]).[11]

Since "weightless" light belongs to nature, it is still matter characterized by self-externality. It thus moves across space, as all matter does, with a certain velocity. Yet, as pure self-identity, light is "*infinite* self-externality" (*Enc.* §276) and so moves with "absolute velocity" (*Enc.* §275A [87]). This in turn is taken by Dieter Wandschneider to mean that, implicitly, Hegel agrees with Einstein that light moves at the same constant speed regardless of the frame of reference (Wandschneider 1987, 305).

"Dark" matter – heavy matter as itself qualitative – is, Hegel maintains, "the opposition [*Gegensatz*] to light's abstractly identical ideality" (*Enc.* §279). Indeed, since such matter is logically separate from light, it is "*opposition* in its own self" and so "falls apart into a *duality*." It is characterized, therefore, by the two forms of difference that, in the doctrine of essence, are not just moments *of* identity (see *SL* 362–70). Qualified heavy matter thus first takes the form of "corporeal *diversity* [*Verschiedenheit*]" or

[11] On Hegel's concept of light, see especially Falkenburg 1993, 537–43.

"material being-for-self" – material separateness that Hegel calls "*rigidity*." Second, it takes the form of "opposition" (*Entgegensetzung*) as such, which, since it stands alone "for itself," is opposed even to itself and so undermines itself and dissolves into "*neutrality*" (in a manner echoing the collapse of opposition in the *Logic* into contradiction and then the "null") (see *SL* 376). For reasons that need not detain us here, Hegel associates rigidity with "*lunar*" bodies – moons that are tidally locked to their planets – and "dissolution and *neutrality*" with comets that behave "*aberrantly*" by following "eccentric" orbits (*Enc.* §279 & R).

In the doctrine of essence, contradiction does not just collapse into the "null" – the neither-nor – but it also leads to the *positive* unity of its moments (i.e., the positive and the negative) (*SL* 376). Similarly, dark matter, as the moment of "opposition," takes the form of a positive unity of "real differences" – a unity that is an "*individual* totality" in its own right. Such a "totality" Hegel finds in planets and specifically the Earth (*Enc.* §280). Qualified matter thus takes the form of all four types of body that make up the solar system as conceived in mechanics.[12] In philosophical physics, however, these bodies are distinguished not just by their mass but by their physical qualities (in Hegel's distinctive sense).

Since the Earth, unlike the other celestial bodies, is the positive *unity* of the moments in "opposition," it must encompass the forms of qualified matter so far derived, or rather matter that is informed by their underlying categories. This includes matter as "undifferentiated simplicity" (initially exemplified by light) to which opposition is itself opposed. As "subordinate moments" of the Earth, however, the different forms of qualified matter cannot constitute separate celestial bodies but must be what Hegel calls the physical "*elements*" (*Enc.* §§281–82). These elements, he contends, are – or are embodied in – air, fire, water, and "earthiness" (*Erdigkeit*) (*Enc.* §§282–85).

Since these elements are *moments* of the earth and so lack the independence of celestial bodies, the natural-logical categories informing the latter must appear in the earth in a negated, and indeed explicitly *negative*, form. Accordingly, Hegel maintains, whereas light is "positive identity-with-self," air is "*negative* universality" and thus, though transparent to light, the "insidious and consuming power over what is individual and organic" (*Enc.* §282). In other words, through its underlying category air is a corrosive element (even if this is explained chemically by the presence of oxygen and moisture) (see *GW* 24, 1: 325.22–23).

[12] Hegel understands asteroids to be "smaller planets" (*Enc.* §270A [82]).

The elements are then further negated in the "elementary" (or "*meteorological*") process, in which, Hegel maintains, they change *dialectically* into one another – in this case, both logically and naturally (*Enc.* §286). This process principally involves water and air and is exemplified by atmospheric condensation (producing clouds and rain) and evaporation, in which, for Hegel, water changes its state from liquid to gaseous and is not just thinly distributed as liquid *water* throughout the air (see *GW* 24, 1: 603–4; 2: 852–54). Yet Hegel also sees such dialectical change in the igniting of tinder through air compression in a fire piston – even though this is not a "meteorological" process – and he claims that this empirical phenomenon finds its "deduction" in the logical transition from air as the "negative" to fire as "self-relating negativity" (*GW* 24, 2: 849; see also 1: 327; 2: 1072–73). Such change is evident too in volcanoes, in which – though again not meteorological processes – the earth produces fire from within itself (*Enc.* §288R).

## 9.5 Hegel's Philosophical Physics: From Specific Gravity to Chemistry

The earth, for Hegel, is the unity of its constituent "elements." In the processes just described, however, the elements negate themselves into one another, and the earth itself proves to be the "*negative unity*" of the latter (*Enc.* §289). When the idea of matter as such a unity is made explicit, matter comes to exhibit new physical qualities.

As an explicit "negative unity," Hegel contends, matter has a unified, but internally differentiated, form – an "immanent form" (*Enc.* §290). This form (and the moment of negation it contains) makes matter more than merely heavy, and indeed "determines matter *in opposition to* its gravity." More specifically, it determines matter to occupy a *space* that is not just a function of the matter's weight or mass. Matter, therefore, now consists in the difference and relation between "the spatial determinateness as such and the matter belonging to it" – between its volume and mass (*Enc.* §290). The physical quality exhibited by matter is thus *density*. Since, however, bodies with density are characterized logically by difference and relation, each must also relate to another body; so, their defining quality is in fact *specific gravity*, which is the density of a body in relation to that of a reference substance (such as water) (*Enc.* §§291–93).[13]

[13] For Hegel's account of specific gravity in the *Logic*, see *SL* 303–5. See also Houlgate 2022, 2:278–87.

Hegel then argues that the "immanent form" of matter must also consist in the "spatial *juxtaposition* [*Nebeneinanderseyn*] of the material parts" that are "distinct from that determined by gravity." In other words, it must consist in the specific *cohesion* of those parts – cohesion that shows itself as "a peculiar *mode of resistance*" to "*other* masses" (*Enc*. §295).[14] Such cohesion in turn takes the form of brittleness, ductility and malleability, and elasticity (*Enc*. §§296–97).

Elasticity is a body's reassertion of itself against the external "negation" it suffers from another body, and it can thus be understood as the *negation* of that negation. In such "double negating" (*Enc*. §299) the body's material parts are compressed and then rebound, and in the process, Hegel contends, they cease simply to lie *outside* one another and become "ideal" moments of the body's changing density. "The ideal" (*das Ideelle*), for Hegel, does not lack being but lacks independence and so is simply a *moment* of a process or unity (*SL* 119; see also Houlgate 2022, 1:247–48). In gravitational motion heavy matter "*sought*" such "*ideality*" – sought to be a unity of moments – but in elasticity the latter now comes into explicit "*existence*" in such matter. Ideality becomes further explicit in the emission of *sound* (*Enc*. §§298–99).

A body that resounds *oscillates* internally. In the process, however, its "*ideality*," or "*inward form*," does not remain submerged in the body, but becomes "*free*," and acquires "*independent existence*," in the sound that the body emits (*Enc*. §§299–300). Since sound detaches itself from its material source, Hegel calls it the "ideal *ideality*" of a body. The further explicit "idealization" of the material body – or the latter's "*real ideality*" – then takes the form of *heat* (*Enc*. §302). Hegel thus understands the latter to be simply the internal "activity," or motion, of the body that causes it to expand and leads eventually to its "dissolution" (through melting, evaporating, or igniting) (*Enc*. §§303, 306–7), and he rejects the contemporary idea that heat is produced by an independent "*heat-matter*" (or "caloric") (*Enc*. §§304R, 305R; see also Posch 2005, 153–58; Hobson 2017, 31, 51).

In Hegel's mechanics, matter is essentially "self-external" and seeks unity with other matter in gravitational movement (see *Enc*. §§262, 271). The logical development we have traced in Hegel's physics then involves the progressive "idealization" of such heavy matter – the progressive negation of its mutually external parts into *moments* of a unity or "totality" that is the (increasingly dynamic) *form* of a body. When such form is rendered further explicit, it becomes "selfhood" as "infinite

[14] Emphasis added to "juxtaposition."

self-relating form," and the body it informs is conceived as a "*free individuality*" – one that, through its form, "freely determines" its own internal structure and relation to other bodies and does not simply *respond* to external effects by rebounding, emitting sound or changing its temperature (*Enc.* §307).

Free, or "total," individuality appears first as simple *shape* (*Gestalt*) – the "*immanent* and *developed* form" that determines, not only a body's "inner connectedness," but also its "external limitation in *space*" (*Enc.* §310). Such form is initially either "*punctiform*" or "*spherical*" (as, for example, in water droplets), and so, Hegel states, is in fact "shape as an inner shapelessness" (*Enc.* §311). It then differentiates itself into opposed "extremes," which, however, "as moments, lack a subsistence [*Bestehen*] of their own" and are "held only in their relation" (*Enc.* §312). Form, as this "identity of *subsisting* differences," determines in turn the spatial relation of a body to another body. More specifically, "the activity of the form" is "to posit the *identical* as *different* and the *different* as *identical*." Such form is thus exemplified, Hegel claims, by *magnetism*, in which identical poles in different bodies repel, and opposing poles attract, one another (*Enc.* §§313–14).[15]

Form then determines a body to be a unity of differences "*through and through*," and so to have a fully "developed form" or shape proper – form that is found, for example, in the *crystal* (*Enc.* §315). At this point, form no longer just determines "relationships of *place*" between bodies (as does magnetism) (*Enc.* §313) but it gives a body a distinctive quality or "*physical specification*" that manifests itself in the body's relation to light and the physical elements (*Enc.* §316). Hegel thus examines the way a shaped body refracts light and displays colors, as well as its relation to air (which gives it a smell) and to water (which gives it a taste) (*Enc.* §§317–22).

Bodies as "shaped wholes," or "*physical* individualities," are then considered in relation *to one another* (*Enc.* §323). According to Hegel, as "wholes," bodies are "independent" of one another. Yet they (or at least many of them) must also stand in a relation of "*physical* tension," in which they are connected *as opposed* – as positive and negative. Since they remain *separate* bodies, however, they do not enter such a relation with all their "concrete determinateness," but only their surfaces come into contact mechanically (through, for example, rubbing against one another) (*Enc.* §324 & R). Moreover, each relates to the other, as Hegel puts it, only as "a reality of the *abstract* self, as *light*, and as light pregnant with

[15] On magnetism and the "concept," see *GW* 24, 1: 366–67.

opposition." When the tension between them is discharged, the result is thus "an undifferentiated light" – a flash – which "immediately vanishes" (together with the "mechanical effect of shock") (*Enc.* §324). Such a relation Hegel calls an "*electrical* relation," and he finds it exemplified in static electricity (*Enc.* §323).

Hegel concludes his physics by arguing that "individuality in its developed totality" requires bodies to relate to one another, not just through surface contact but as "individual totalities, as whole particular bodies" (*Enc.* §326). In such "chemical" relations, he maintains, bodies that are "simply opposed" to one another, such as acids and alkalis, combine to form neutral salts, but compounds are also separated into their components (*Enc.* §§332, 334). In this process, all such bodies prove to be, not just the "immediate presuppositions" of chemical reactions, but *products* of the latter – moments whose existence is dependent upon, and relative to, the processes that give rise to them. "What is thus posited in general in the chemical process," Hegel writes, "is the *relativity* of the immediate substances and properties" (*Enc.* §336).

Hegel points out, however, that the end of one chemical process does not directly initiate a different one: "[W]hat is dissociated," for example, "falls apart into mutually indifferent products" that do not immediately react with one another again (*Enc.* §335). Chemical processes that do give rise to, and so reproduce, one another, thus cease being purely *chemical*. They form a single "infinite process that kindles and sustains itself" – the process of *life* – and we pass from the sphere of physics into that of "organic physics" (*Enc.* §§336–37).

## 9.6 The Problem of Light

My account of Hegel's physics is highly abridged, but it shows that the latter discloses what is made necessary in one sphere of nature by *reason* – specifically, the *physical* phenomena, or rather corresponding categories, that reason requires there to be. This is not to deny that, for Hegel, such phenomena have natural conditions that science must discover. Yet he argues that the category (or way of being) informing one phenomenon renders explicit what is implicit in another category and in that sense each phenomenon is made necessary *logically* by its predecessor.

Some of Hegel's arguments ground criticisms of early nineteenth-century science (such as his rejection of "heat-matter"). Yet, in his view, philosophical physics is not inherently at odds with science (and certainly does not ignore the latter's empirical findings). What are we to say,

however, if Hegel's physics appears to be at odds with more recent science? This is the problem with his account of light (see Falkenburg 1993, 531–32).

Hegel connects light with the category of "*pure identity*-with-self" (*Enc.* §275) and concludes that it is thus not "*divisible* into *masses*," as heavy matter is – a position that accords with the modern view that photons have no mass (*Enc.* §276R; Cox and Forshaw 2011, 204, 208). Yet he goes further and insists that light is "without difference in itself" (*GW* 24, 1: 581) and so contains no distinct "corpuscles" or "waves" at all (*Enc.* §276R). In this respect, Hegel's conception of light appears quite at odds with that of modern physics, for which light exhibits both "particle behavior" and "wave behavior" (Calle 2001, 422). Closer inspection reveals, however, that the two conceptions of light are not in fact incompatible.

Note first that Hegel does not seek to provide an exhaustive account of light but aims only to show that light, as an observable phenomenon, exemplifies the category of identity in the ways indicated in Section 9.4. Further aspects of light, he concedes, may be brought out by "the empirical sciences" (*GW* 24, 1: 293.9–11). Moreover, he is aware of Oersted's discovery (in 1820) that a magnetic effect is associated with an electric current (*Enc.* §326A [234]; see Gribbin 2002, 416). His conception of light thus leaves room in principle for the idea that light is itself a form of electromagnetic radiation, even though he does not entertain this idea himself.

Second, Hegel does not actually banish all difference and negation from light. He acknowledges that light can be *limited* in various ways by "dark" matter and refracted by a prism into different colors (*Enc.* §§277, 278R, 320R [319–20]). Furthermore, he suggests on occasion that light *implicitly* contains difference within itself. He says, for example, that light is the "oneness [*Eins-Seyn*] of different determinations" (*GW* 24, 2: 1053.25) and – in partial anticipation of James Clerk Maxwell – that light is "determinateness, *oscillation*, but only in itself" (*Enc.* §275A [88]; see Calle 2001, 405).

What Hegel rejects, however, is the idea that observable light "consists," or is "composed," of "discrete, simple *rays* of light, and of *particles* and *bundles* of them" (*Enc.* §§276R, 320R [198–99]). So, does modern physics contradict Hegel in this regard?

Such physics is concerned, not just with the observable qualities of light, but with light as electromagnetic radiation that is describable, in quantitative terms, through mathematics (though its predictions must still match the results of experiments) (see Falkenburg 1993, 532; Cox and Forshaw

2011, 13–14, 41). Yet physics clearly understands light to contain, or "consist of," electromagnetic waves of different frequencies, and it maintains that such waves propagate in distinct quanta or "photons" (see Calle 2001, 143–44; Cox and Forshaw 2011, 64–65).

Light waves and photons, however, are not conceived by physics in precisely the way that Hegel rejects. Hegel dismisses what he regards as the crude scientific view that light consists of quite "discrete" and "simple" rays or particles (*Enc.* §276R). In quantum physics, however, photons are not just discrete, simple units of light – "not the small isolated particles" that "Newton had in mind" – but they behave (individually, not only collectively) like *waves* (Hobson 2017, 23; see also Cox and Forshaw 2011, 65). Indeed, they are quanta *of* light waves, and as such must be conceived as "spatially extended objects" that are not, strictly speaking, particles at all but "*sometimes* behave like small particles" (Hobson 2017, 5, see also 6, 28, 79, 84).

Furthermore, light waves, considered *as waves*, are not simple and discrete either. For Maxwell, light is "the propagation of oscillating electric and magnetic fields through space" in the form of "an electromagnetic wave" (Calle 2001, 405).[16] It is not, however, just one uniform wave but consists of different waves of different frequencies (see Calle 2001, 143, 412). Yet the latter as propagating electromagnetic *fields* – albeit ones that propagate in quanta – overlap and thereby, through "superposition," act like a single field (see Hobson 2017, 69, 77, 149, 168, 217). Indeed, according to Art Hobson, they are vibrations or "disturbances" *of* a single, unified electromagnetic field that is "present everywhere" (Hobson 2017, 30, 78–79). This then renders intelligible how an "infinite possible number of different electromagnetic waves" (Calle 2001, 413) can produce observable light that Hegel understands as the "*oneness* of different determinations" (*GW* 24, 2: 1053.25, emphasis added), and indeed as "*identity*-with-self" (*Enc.* §275).

Modern physics clearly goes beyond Hegel and, moreover, introduces into light, conceived as electromagnetic radiation, components that Hegel wants to banish from observable light: waves and "particles" (in the form of photons). Yet physics does not conceive of those components in exactly the manner criticized by Hegel, namely as utterly simple and discrete (and as connected "externally") (*GW* 24, 1: 301).[17] So while light, for quantum physics, has a different, and more complex, structure from that attributed

[16] See also Hobson 2017, 64: "Maxwell showed his equations implied EM fields could spread through empty space."

[17] For a similar point about quarks, see Posch 2011, 191–92.

to observable light by Hegel, the two do not diverge from one another completely – at least in the respect I have considered – and it is possible to see how *different* electromagnetic light waves (and their photons) can form, not just an aggregate, but an observable *unity*.

Light can thus be understood, in the philosophy of nature, as an observable phenomenon that exhibits logical "identity" without "discrete, simple" constituents (and that is refracted *into* qualitatively different colors by a medium, such as a prism). Yet it can be further understood, in modern physics, as radiation consisting of vibrations, or "waves," of the electromagnetic field that propagate in "photons" – components that are quantitatively distinct from one another but *not* wholly "discrete" and "simple" in the sense that Hegel rejects. Philosophy and physics, in other words, disclose two different, but not incompatible, aspects of light, neither of which alone exhausts the character of the latter.[18]

Hegel understood science to be primarily an empirical discipline. He was thus critical of the scientific attempt to prove claims about physical (rather than mechanical) aspects of nature "mathematically" (*GW* 24, 1: 587), and also of the use in science of what he regarded as the abstractly metaphysical concept of "force" (see *Enc*. §270R [269]). He may well, therefore, have been critical of quantum physics, insofar as it no longer restricts its description of nature "to things we can directly sense" and makes extensive use of the concept of "force" (Cox and Forshaw 2011, 40; Hobson 2017, 12, 45–49). Despite his criticisms of science, however, Hegel saw the latter as, in principle, complementing, not competing with, the philosophy of nature. We who live after Hegel, and know that mathematically based predictions in quantum physics have been confirmed by experiment,[19] can thus understand such physics as complementing his philosophy of nature, rather than competing with it.[20] Yet we should also understand Hegel's philosophy of nature as complementing quantum physics: For, although nature can be made intelligible in quantitative terms at the microscopic level (perhaps through a single, unified "*theory of everything*") (Hobson 2017, 97), Hegel shows that at the

[18] Hegel understands light to have "infinite extension [*Ausdehnung*]," that is, to spread itself across space (*Enc*. §276R [92]). Space, however, is "pure quantity" existing "externally" (*Enc*. §254R), and quantity in turn "contains the two moments of continuity and discreteness" (*SL* 165). In this respect, light, as Hegel conceives it, is possibly more similar in structure than I have indicated to the "quantized field" that physics understands light to be (see Hobson 2017, 92).

[19] See, for example, Hobson 2017, 92: "[Dirac's] predicted positron was discovered experimentally a few years later."

[20] On the compatibility of Hegel's philosophy of nature with special and general relativity and with Darwin's theory of evolution, see Houlgate 2005, 156–60, 173–75. See also Wandschneider 1982.

macroscopic level it comprises "*stages*" that are logically, and in that sense qualitatively, distinct (*Enc.* §249) – stages that should not be reduced to one another or to a single, univocal way of being (or, indeed, to mere effects of microscopic "quantum" activity).[21] Whether quantum physicists might also share this understanding, and see in Hegel's philosophical account of light a conception that complements their own, I cannot say.

[21] Art Hobson argues that objects "lose their extended quantum field nature and behave classically" through "decoherence" – the process of becoming *determinate* (either this or that) (Hobson 2017, 222). This process alone, however, does not explain the different "stages" of nature derived in Hegel's philosophy of nature. On Hegel's anti-reductivism, see Houlgate 2005, 119–20 and Posch 2011, 189–91.

PART III

# *Organics*

CHAPTER 10

# *Hegel's Theory of Animal Embodiment*

*Christopher Yeomans*

With animal embodiment, the project of Hegel's Philosophy of Nature comes full circle: The opening selection of text on space and time end with twin terms – place and movement – and in animal embodiment we finally get the natural phenomenon that does justice to both. The animal body is the first physical body to have three properly distinguished dimensions, and it is only in virtue of those qualitative, organic dimensions that we can abstract away a three-dimensional Euclidean space in which such bodies are taken to appear and to move.[1] The claim to be redeemed here was made in (Kaufmann and Yeomans 2023, 111–12):

> Our most radical claim is anticipatory and cannot be fully established here, but deserves stating because it sets out the goal of Hegel's discussion of space and time: the addition of free choice (2.1) to *inclusion* (2.2) allows Hegel to recoup both *linearity* (1.1) and *homogeneity* (1) in local contexts via motion and eventually the movement of animal bodies. The addition of time then gives you the dimensionality of space in the intuitive sense, *but only in the local contexts and perceiving animals in which intuition is at home*.

To briefly recap the argument made in that earlier paper, Hegel argues that our intuitive conceptions of what constitutes a dimension – a linear extension or just a measurable extent – are incapable of providing conceptual resources for individuating and thus counting dimensions. In the absence of that ability, we are at a loss to say what the three-dimensionality of space amounts to, and thus at a loss to characterize perhaps the single most basic aspect of natural space. Through the development of geometrical figures (point-line-plane-enclosing surface), each step of which adds an additional dimension, Hegel points to a conception of dimensionality

[1] Here and throughout the chapter, "Euclidian" is used in the modern mathematical sense, in which the primary contrast is "affine" space rather than "non-Euclidian" space. Thus, the essential features of Euclidian space in this modern usage are its measurability and orientability, rather than the obtaining of the parallel postulate.

that would now be called an *inclusion* dimension (such as the Krull dimension in contemporary mathematics). In such a dimension, we count by the steps in a chain of inclusion, so that, for example, a line is one-dimensional because it is one step beyond the point, which it includes. This inclusion sense of a dimension, however, is algebraic or discrete, and thus loses the linearity and homogeneity that attach to the intuitive senses of a dimension that characterize our experience of space. And, indeed, on Hegel's view we never recapture that experience as a *global* characterization of space; we never have the intuition of space as a continuous and unbounded extended whole as Kant thought. We do, however, recapture that experience as a *local* characterization of the context of movement through the combination of space with time. In particular, with time we get what we call a *freedom* dimension: a degree of freedom in a system, that is, a parameter that has a free choice. The more such parameters a system has, the more dimensions it has. Hegel makes the peculiar claim that time has three dimensions; we interpret this to mean that time is three-dimensional because it is *linear*, *ordered*, and *has a special point 0* (i.e., *now*). The linearity of time is obviously a linear dimension, but the last two are freedom dimensions – different orderings or special points can be picked – and those two are connected to the linear dimension via a string of inclusions, so the total number of dimensions of time is counted in the same way as are the dimensions of space.

When it comes to the freedom of picking an ordering and a special point via movement, the central text is Hegel's own first introduction of the animal (*das Tier*):

> The animal has contingent *self-movement* because its subjectivity is a free time in the way that light is ideality wrested away from gravity, and which, as withdrawn from real externality, *determines its place* from itself and according to its own whim. (*Enc*. §531)
>
> (*Das Tier hat zufällige* Selbstbewegung*, weil seine Subjectivität, wie das Licht, die der Schwere entrissene Idealität, eine freie Zeit ist, die, als der reellen Äußerlichkeit entnommen, sich nach innerem Zufall aus sich* selbst zum Orte bestimmt.)

The basic task of this chapter is thus to understand how the free time of the animal makes its contingent self-movement in three dimensions possible and makes it possible in the sense of *also constituting the three dimensions "within which" such movement takes place*. The basic tension is that we need both fixed axes of variation to constitute the dimensions but free determination along those axes. How to get this tension right is a

problem analogous to the problem Hegel sets himself in the *Logic* which he says is like the task of repairing a fishing net – one wants to get rid of the tangles that prevent it from moving freely but keep the knots that give it structure (*WL* 21.15).

The first key notion is Hegel's claim that the organic individual exists as subjectivity insofar as it is idealized into members (*Gliedern*) (*Enc.* 2 §350). That is, something about the free time of subjectivity requires the articulation of the body – this will give us our connection between the two sides of the tension, and the different parts of the body will orient the animal both toward itself and toward its environment in three dimensions. A comparison with more basic mechanics might be helpful: In the Addition (*Zusatz*) appended to *Enc.* §262, Hegel points out that gravity (*Schwere*) gives you the shape of a ball (*Kugel*). The ball is the shape that results when attraction and repulsion compete in a nondimensional way (i.e., equally in all dimensions). In contrast, animal bodies are extended nonhomogeneously, and whatever attraction and repulsion are involved will be different along different dimensions. More radically put, the different lines along which animal bodies are extended *constitute* qualitatively different dimensions. The result is an enclosing surface that is not uniform and nonoriented like a ball but rather an enclosing surface that is nonuniform and oriented left–right, up–down, and forward–backward. But it will only be the qualitative differences between the members that generates the nonuniform surface, and which thus finally makes dimensions discriminable as length, width, and height. It is these discriminable dimensions that form the concrete basis from which the x, y, and z axes are abstracted in geometry.

Hegel divides his discussion of the animal into discussions of its formation, assimilation, and species process, and I adopt that categorization as the structure of this chapter. Because the characterization I am offering is highly theoretical and in a vocabulary that is not Hegel's own, I stick close to the text and its order to enable comprehension of specific passages. In each section, I lay out the different forms of spatial and temporal dimensionality that each aspect of the animal's body enables. As a first pass, we can say that form (*Gestalt*) gives us the special point 0 for time and the step from the plane to an enclosing surface for space; assimilation gives us the order of time and the step from line to plane for space; and the species process (*Gattusprozeß*) gives us the linearity of time and the step from point to line for space. These combinations display the animal body as the spatio-temporal object par excellence, and thus the object by reference to which all spatiality and temporality is understood. If we think

of understanding a phenomenon by reference to its fullest expression as a characteristically rationalist move (as opposed to the characteristically empiricist move of understand a phenomenon by reference to its simplest expression), then we can call this *Hegel's rationalism about space and time* (see *Enc.* §252A).

## 10.1 Form

In some ways, the point in this section is quite simple. Before we can talk about what an animal body does to inorganic bodies or with other animal bodies, we need to construct the animal body itself. What kind of a place is it, and what sort of time does it have? Hegel constructs the animal body by constructing its form (*Gestalt*), which means considering the animal "as the individual idea, which in its processes refers only to itself and merges with itself within itself [*als die individuelle Idee, die in ihrem Prozesse sich nur auf sich selbst bezieht und innerhalb ihrer selbst sich mit sich zusammenschließt*]" (*Enc.* §353). This we will understand in terms of the spatial inclusion dimension of the step from the plane to the enclosing surface, and in terms of the temporal freedom dimension of a special point 0. We will go on to flesh out this point in some detail, but it is worth lingering just on this first brief description of what we are doing when we consider the animal as form, in order to develop an initial grasp of the point.

To begin with, the notion of an *individual idea* is naturally the notion of something with a distinctiveness or uniqueness, and which can be picked out as one rather than as a heap, an arbitrary point, or a continuum. This then branches into both a temporal and a spatial articulation of that oneness. In the notion of processes in which the animal only refers to itself we get the temporal articulation. Hegel does not speak of processes until the part of the Philosophy of Nature entitled Physics, which is when he first speaks of thermodynamic and electrical phenomena that have a temporal direction specified by the nature of the phenomena (as opposed to mechanics). That these processes are self-referential specifies the animal's body as a distinctive temporal moment, an extended present in which the processes coincide and at which they aim. In this way the body presents a special temporal point 0, an origin point for the local time of the animal. Second, the notion of something merging or joining with itself is almost already the image of a plane bending around to enclose a space. One might expect a point rather than a plane or a surface, but that wouldn't make sense of the notion of something happening *within* itself

(since a point is not extended, and thus has no interiority). Thus, we come to the interesting correlation between a temporal point and a spatial region, but this temporal point is extended by the processes that take place in it. To use another metaphor employed by Hegel for the free time of the animal, it is a "free trembling within itself [*freies Erzittern in sich selbst*]" (*Enc.* §351). And furthermore, he emphasizes that "Form is the animal subject as a whole *only in relation to itself*" (*Enc.* §353). This is clearly a specific perspective, designed to bring out specific features of the animal body – namely concerning the way in which its articulated form is self-referential. Hegel finds three kinds of such self-referentiality, which are thus three ways in which the animal is formed. The three kinds of self-referentiality are sensibility, irritability, and reproduction, and the corresponding ways in which the animal is formed are the nervous, circulatory, and digestive systems. Every bit of the animal is revealed to be a spatio-temporal region of the animal's enclosed space and extended present by virtue of its interaction with these three systems. Collectively they are the coordinate system that specify the bounded and internally articulated space of the animal's body and the different rhythms that give temporal structure to its extended present. Hegel is quite clear, in introducing these three systems, that they correspond to the conceptual moments – universality, particularity, and individuality, respectively (*Enc.* §354) – and thus Hegel's construction of the animal body aims to make good on his initial claim that the three-dimensionality of space follows from the threefold nature of the concept (*Enc.* §255).

In the following reconstruction I largely abstract away from the logical foundations and attempt to make good on the claim that these systems construct a distinctive spatio-temporality of the animal body, but there is a logical aspect of these systems that is important to bring to the fore. This aspect is a feature that Hegel emphasizes in the *Logic*'s first section on the subjective concept, but which extends to the later presentation of the Idea as well: Each conceptual moment is a standpoint from which perspective the other conceptual moments are brought into view (see Yeomans 2019). In *Enc.* §354 Hegel writes that: "These three moments of the *concept* are (b) not only implicitly concrete elements [i.e., sensibility, irritability, and reproduction], but rather have their reality in three systems, the nervous, circulatory, and digestive systems, of which each as totality differentiates itself within itself according to the same conceptual determinations." What this means is that each of these three systems is a way of presenting the whole from a particular perspective – that is, from the universal perspective of sensibility, the particular perspective of irritability, and the individual

perspective of reproduction. Again, I won't try to make those abstract conceptual determinations do much work here, but it is important to note that, dimensionally speaking, Hegel is presenting the systems as spatial and temporal axes that run through every point in a bounded region, and thus constitute the local space and time of the animal. Every part is involved in a process that involves all three systems and so is oriented by the spatial connections and temporal scales of all three processes at once. The *Zusatz* to *Enc.* §354 sets this out nicely:

> Since sensibility as a nervous system, irritability as a circulatory system, and reproduction as a digestive system also exist for themselves, the body of all animals can be broken down into three different constituents, from which all organs are composed: in cell tissue, muscle fibers and nerve marrow - the simple, abstract elements of the three systems. But since these systems are just as undivided and every point contains all three in an immediate unity, they are not the abstract conceptual moments, universality, particularity and particularity. Rather, each of these moments represents the totality of the concept in its determinateness, so that the other systems are present in each as existing: everywhere there is blood and nerves, everywhere also something glandular, lymphatic, which makes up reproduction.[2]

There is thus running through every bodily point in the internal space of the animal a set of processes and constituents, and the specific spatio-temporal location of each point within the animal is determinable by reference to those processes and constituents. And this determinability demarcates the animal's body from its environment – it may be related to its environment in complicated ways that Hegel aims to cover in his treatment of assimilation and the species process, but only the points within the body itself are directly codetermined by these three systems.[3]

There is an even further set of spatio-temporal determinations which Hegel adds in *Enc.* §355, and which to some degree point the way to the significance of Assimilation and the Species Process as well. In that section, Hegel argues that not only are internal points defined by reference to these systems, but the systems themselves have and mark out distinctive

[2] In the previous addition (§353A) there is also a comparison of the three systems with the elements of the solar system, according to which sensibility is like the sun, assimilation is like the comet and moon, and reproduction is like the planet earth. These can easily seem bizarre associations, but they have to do with relative centers of motion, and the analogy marks out these organic systems as different kinds of centers for different kinds of movement within the animal body.

[3] For another treatment of Hegel on animal spaces that goes in the opposite direction to that pursued in the present chapter, emphasizing the way in which digestion undermines the objective distinction between the inner and the outer, see (Ferrini 2020, 254). In my view, Ferrini overgeneralizes the point about digestion and thus misses the way the space itself is constructed by the animal.

locations and orientations. The systems themselves mark out distinctive and qualitatively distinct regions of the body – the head, the torso, and the abdomen – as the areas dominated by the nervous, circulatory, and digestive systems. These centers (*Centra*) of the three systems are, of course, partially enclosed spaces themselves, and are even enclosed by qualitatively different surfaces (skull, ribs, skin). The general enclosed space of the animal body is thus given further articulation into these multiple partially enclosed spaces. Hegel also thinks that these systems each have an inward-facing and outward-facing element or character, which distinguishes in a general way between inner and outer – really three different ways of differentiating between inner and outer (as relevant to sensation, circulation, or digestion). And finally, there is the relationship to other individuals in the environment, particularly along lines of sex difference – here we get a relationship between enclosed spaces themselves, which Hegel mainly leaves for Assimilation and the Species Process.

Most of the sections on form are clearly spatial, but in *Enc.* §356 Hegel turns more explicitly to the temporal aspect through the notion of process:

> [Form] is as living essentially process, and furthermore as *abstract*, the *formation process within itself*, in which the organism makes its own members [*Glieder*] into its inorganic nature, into means, draws sustenance from them [*aus sich zehrt*] and self-produces itself, i.e., even this totality of articulation [*Gliederung*], so that every member is reciprocally end and means, preserved from the others and against them – the process, which results in simple immediate proprioception [*Selbstgefühl*].

For the notion that form specifies a temporal special point 0, the two most important aspects of Hegel's discussion are the way in which processes render each member of the animal both end and means, and the way in which the process as a whole produces proprioception. That Hegel would appeal not just to purposive functioning, but to a reciprocal form of purposive functioning, emphasizes the simultaneity of the processes involved. As Kant made abundantly clear, mechanistic causal relations have an essentially progressive temporal structure – the cause must precede the effect. In contrast, both reciprocal interaction and purposive functioning presuppose the simultaneity of cause and effect, means and end. And particularly with purposive functioning, that simultaneity is construed in terms of an extended present. The animal then has an awareness of this special temporal point that it is – has an awareness of its own present – as a simple awareness of its own body. But that awareness that it has a location of its own – that it is its own place – is *produced* by the interaction of these functional systems. The time of the animal body is the time in which it

simultaneously communicates with its members, circulates blood, and digests food. This time is thus an overlap of an incredibly fast communication system (the nervous system), a medium-paced circulatory system, and a slow digestive system. For the human body, for example, nervous signals to the muscles can travel at more than 100 meters per second (m/s), blood at 0.25 m/s, and digestion at 1/20,000 m/s. Or perhaps better is to note that nerves are constantly firing in multiple direction, blood circulates with a pump that works approximately seventy-five times per minute and circulation takes approximately forty-five seconds, and digestion goes in one direction, taking anywhere from twenty-four to seventy-two hours to complete. The special point in time that the animal represents is thus defined as that extended present that encompasses all three processes, and this is the time of the animal's proprioception. Importantly, we almost never feel either our digestion or our circulation, and never our nervous system actually firing, but we are aware of ourselves in a distinctive present with a distinctive temporal scale that would be quite different if it did not involve the overlap and tension between the scales of these three systems. It is not that we are aware *of* those systems but that we are aware of ourselves *by virtue of* those systems.

## 10.2 Assimilation

With assimilation, we get the temporal dimension of an order and the spatial dimension of the step from the line to the plane. With respect to the latter, we just saw the way in which aspects of the form-systems of the animal generated an initial distinction between inner and outer but in a relatively undifferentiated way. These could be visualized as a line or as a set of lines. But in assimilation, these hints are picked up and fully developed, leading to two fundamentally different registers of the distinction between inner and outer, which can be visualized as a plane in two dimensions. These two dimensions are theoretical and practical assimilation, or the senses and the instinctual desires. These make possible a determinate feeling of inside vs. outside along two different axes that can be related to each other in informative ways.

If we begin with Hegel's initial presentation in *Enc.* §352, we understand the assimilating animal body as "the idea, which relates itself to its other, its inorganic nature, and posits that nature ideally in itself [*als Idee, die sich zu ihrem Anderen, ihrer unorganischen Natur verhält und sie ideell in sich setzt*]." Hegel emphasizes that in this process of repositing nature in an ideal form, the distinction between inner and outer is marked and

proprioception is thus made determinate. The animal is tensed against nature and this tension renders the sense of nature as outer determinate:

> The proprioception of individuality is however just as much exclusive and tensed against an inorganic nature as against its external condition and material. Insofar as (a) the animal organization is immediately reflected into itself in this external relationship, this ideal relating is the theoretical process, sensibility as external process, and furthermore as determinate feeling, which differentiates itself into the multiple sensibility of inorganic nature. (*Enc*. §357)
>
> *Das Selbstgefühl der Einzelnheit ist aber ebenso unmittelbar ausschließend und gegen eine unorganische Natur als gegen seine äußerliche Bedingung und Material sich spannend. Indem (a) die tierische Organisation in dieser äußerlichen Beziehung unmittelbar in sich reflektiert ist, so ist dies ideelle Verhalten der theoretische Prozeß, die Sensibilität als äußerer Prozeß, und zwar als bestimmtes Gefühl, welches sich in die Vielsinnigkeit der unorganischen Natur unterscheidet.*

Here the direction of the process – and that means the temporal order of the process as well – is from outer to inner. Something outer exists and then impinges on the senses of the animal. Though a full discussion is beyond the bounds of this chapter, two features of Hegel's discussion of the senses deserve particular mention. First, he constructs the senses as ways in which the animal body is related to the kinds of phenomena that have been discussed in earlier parts of the book. Feeling is the sense of mechanical phenomena, taste and smell are the sensation of physical phenomena, and sight and hearing are the sensation of ideal phenomena (i.e., of light and sound) (*Enc.* §358). The construction of the senses is a construction of the determinate spatio-temporal relations in which those phenomena stand to an observer who is globally placed in the sense of not directly being an element of the system that is sensed. Second, though there is only the relation between the animal body and three kinds of phenomena (mechanical, physical, ideal), there are five senses because of the doubling of particularity in physical and ideal phenomena – that is, the thought that such phenomena require qualitatively distinct kinds of entities (*Enc*. §358R).

In contrast to the "theoretical" process of the senses, there is the "real" or "practical" process of the instincts:

> The *real process* or the *practical* relation to inorganic nature begins with diremption in itself, with the feeling of externality as the *negation* of the subject, which is at the same time the positive relation to itself and whose

> *certainty* is against this its negation – with the feeling of *lack* and the *drive* to overcome it, with respect to which appears the condition of its *becoming excited* from outside and negation of the subject posited within it in the mode of an *object* against which it is tensed. (*Enc*. §359)
>
> (*Der reelle Prozeß oder das praktische Verhältnis zu der unorganischen Natur beginnt mit der Diremtion in sich selbst, dem Gefühle der Äußerlichkeit als der Negation des Subjekts, welches zugleich die positive Beziehung auf sich selbst und deren Gewißheit gegen diese seine Negation ist, - mit dem Gefühl des Mangels und dem Trieb, ihn aufzuheben, an welchem die Bedingung eines Erregtwerdens von außen und die darin gesetzte Negation des Subjekts in der Weise eines Objekts, gegen das jenes gespannt ist, erscheint*.)

Here we have an axis with a different order, beginning in the animal subject and proceeding to the object within nature. If in the theoretical process the order is felt by the way in which the objects of the senses impinge on that subject, in the practical process first a sense of oneself as lacking something generates the turn outward and the search for a way to overcome that lack. In the following section he represents this drive as the animal's attempt to overcome the merely subjective form of the content of that drive, that is, to make that content objective (*Enc.* §360).

There is an additional distinction between the temporality of theoretical and practical assimilation that returns to an issue we have already seen, namely the difference between the temporality of mechanical causation and purposive interaction. The former is more strictly progressive, the latter more bidirectional and simultaneous. In the theoretical assimilation of the senses, at least the emphasis is on the causal impingement of the world on the subject. In contrast, in practical assimilation not only does everything start with the "becoming excited" of the subject, but Hegel is at pains to emphasize the teleological nature of the drives and instincts (*Enc.* §360).[4]

Both theoretical and practical assimilation play a role in constructing the local space of the animal. This is perhaps obvious for the senses (since they are limited to varying degrees in the scope of their awareness), but Hegel also notes this for practical assimilation:

> But [only] as the relationship of the animal to *its own* inorganic, *individualized* nature, is [the connection] determinate at all, and because of further particularity only a limited region of universal inorganic nature is its own. Instinct is a *practical* relating to it, inner excitement in the guise of an

[4] In *Enc.* §360R, he both praises Kant for renewing the Aristotelian conception of inner teleology and criticizes the tendency to treat ends as essentially conscious. The ends of the animal are unconscious (*bewußtlos*). See (Ferrini 2009a).

> external excitement, and its activity is partially formal and partially real assimilation of inorganic nature. (*Enc*. §361)[5]
>
> (*Aber als Verhältnis des Tiers zu* seiner *unorganischen,* vereinzelten *Natur ist [der Zusammenhang] überhaupt* bestimmt*, und nach weiterer Partikularität ist nur ein beschränkter Umkreis der allgemeinen unorganischen Natur der seinige. Der Instinkt ist gegen sie ein* praktisches *Verhalten, innere Erregung mit dem Scheine einer äußerlichen Erregung verbunden, und seine Tätigkeit teils* formelle *teils* reelle Assimilation *der unorganischen Natur.*)

The animal body does not directly relate to anything like a global space but relates to universal nature through the constitution of a local space, a limited region which is its own. With respect to that region and the individuals within it, the animal can measure the space and orient itself to it by means of its senses and drives. It exists in tension with the individual objects in the space, and those lines of tension provide the orientation to the local space as such; the strength of those tensions allows for the measurement of distance along different parameters. That Hegel means the processes of theoretical and practical assimilation to have such a profound function is in part signaled by his attempts to distinguish them sharply from sleep and wake cycles, as well as migration – these are "an unmediated going-along (*Mitgehen*) with nature and its changes" (in *Enc.* §361 & A).

He further takes them up in *Enc*. §362:

> Life, the subject of these moments of totality, tenses itself in itself [*spannt sich in sich*] as concept and in the moments as reality external to it and is in continuous [*fortdauernd*] conflict, in which it overcomes this externality. Because the animal, which behaves here as immediate individual, is enabled only individually along all determinations of individuality (this place, this time, etc.) [*dies nu rim einzelnen nach allen Bestimmungen der Einzelheit (dieses Orts, dieser Zeit usf.) vermag*], this realization of itself is not adequate to its concept, and it returns continuously [*fortdauernd*] from its satisfaction into a condition of need.

The "moments of totality" to which he refers are three processes of the real assimilation of inorganic nature – breath, thirst, and hunger – and their satisfaction. Here the continual return of the tensions is key to perhaps the hardest point in the Philosophy of Nature, which is to understand how time could be three-dimensional and three-dimensional in the Philosophy

[5] For a discussion of Hegel's conception of instinct with reference to Blumenbach's *Bildungstrieb*, see (Kelm 2018).

of Nature in which there is no proper past or future, only the present. In this continual return to the same condition of need, where the condition generates the purposiveness of the animal's practical activities, we have a return to the same time – to the same present. It is a special point, it is ordered, and it is even locally linear (there is a continuous time from need to satisfaction and back to need). But it doesn't point beyond itself to a future nor leave behind itself a past. Instead there is an extended, tensed present in which the cycles of breathing, drinking, and eating co-occur. But these cycles are different from the cycles of formation – of nervous functioning, blood circulation, and digestion – because these cycles of formation have an outward orientation, even though they alternate between states of need and satisfaction: "The desiring organism, which knows itself as the unity of itself and that which confronts it, and so sees through the being of the other, is the form which is turned outward and armed [*die nach außen gekehrte, bewaffnete Gestalt*]." (*Enc.* §363A; see also *Enc.* §365).[6]

## 10.3 Species Process

In the species process,[7] we return to a simplified view of the animal body – of that body as an instance of a species, "in *implicit* simple unity" with the species (*Enc.* §367) – and we trace the way that these simple instances are necessarily connected with each other in a progressive way.[8] This is how the linearity of time is presented, along with the transition from a point to a line to depict space. It is furthermore the capstone process, because in these transitions from points to lines it shows us how local space-timelines are built up into global space-timelines. Here we take animal bodies that are special temporal points and enclosed spaces, which have temporal orientations and multiple spatial axes oriented by the inner vs. outer contrast, and reduce them to simple points which are then shown to be in a linear relation

[6] In *Enc.* §361–65, there is quite a bit of discussion of the relation between organic assimilation and earlier kinds of phenomena (particularly mechanical and chemical). It is beyond the bounds of this short chapter to reconstruct these relations, but it is the implication of the argument of this chapter that those relations also show the way in which such phenomena can be placed in the space-time that is measured and oriented by animal perception.

[7] Throughout, I translate "*Gattung*" as "species," except for those passage where it is contrasted with "*Art*," in which case I translate the latter as "species" and the former as "genus." Hegel uses the term primarily to refer not to a specific level in the hierarchy of species but to the notion of a kind of an animal more general than an individual. It is our judgment that the term "species" better captures this general meaning in English than "genus."

[8] It is worth noting here Hegel's well-known rejection of the evolutionary theories of his day, which would provide another route to the unification of local and global timelines. There no space to go into the issue here, but the best treatment of the subject remains (Kolb 2008).

with other bodies construed as simple points. Thus it is not surprising that in his initial presentation of the species process, we see language that is also used in the development of Hegel's conception of quantity, for example, "the idea, as related to an other, which is itself living individual, and thereby related to itself in the other – the species process" (*Enc.* §352).

In addition, we get three ways in which the local and the global are related in the three aspects of the species process. First, in the relation between genus and species (*Gattung und Arten*), we get the traditional pyramidal structure but also the violent competition between members of the same genus, which provides one way in which the local space-timelines of individual animals are connected. Second, in the sex-relationship, we get the space-timeline of the animal species stitched together, as it were, by the overlapping lifespans of reproducing animals. Finally, we get the internally determined measure of the animal's space-timeline, through sickness and natural death.[9] Though all three processes give us different forms of linearity, there is a recursive element to the analysis by which they give us the linear version of an enclosed space, of a line, and of an extended point. The pyramidal structure is an enclosed space which is primarily rendered as the lines of the base, that is, the lines representing the competitive struggles between members of the species that stands at the apex. The species is not a separate entity, so it isn't a real spatio-temporal location, but it sets out the dimensions of the base, which are filled as a kind of affine space of lines of competition, rather than a Euclidean space that is globally orientable. The line provided by the process of mating and reproduction is similarly complex. Though an implicit unity of the species is produced by the mating process, Hegel says, the actually existent time line is produced through the overlapping of the times of individual animals as mating pairs and as generations. The first two relationships Hegel characterizes as ones in which "the process of the self-mediation of the species with itself through its diremption into individuals and the supersession [*Aufheben*] of their differences proceeds" (*Enc.* §371). Finally, in sickness, the inner linear extent of the lifespan of the animal is given form, but paradoxically its measure is determined by the ways in which it comes apart. In contrast to the first two, Hegel characterizes this third relation as the negative relation of the species to the individual – sickness is the way the species makes the case that it is something above and beyond the individual, as it were.

[9] At any rate, this seems to be the order of the 1830 edition of the text. Petry reorders them, to reverse the first and the second, and there is some textual evidence in his favor (e.g., *Enc.* §367A). For our argument, nothing hangs on the order.

There is a lot going on in the first relation of genus and species, but one of the most important parts comes out in the voluminous lecture notes appended by Michelet as the Addition (*Zusatz*) to *Enc.* §368, in which Hegel makes the claim that the differences between the species of the genus, and between the genera of the single type "animal," are the same differences as were developed already in the system of inorganic nature. There is a lot of detailed lecture material here, and so the point can't be given the treatment it deserves in this short chapter, but this is in principle another way in which the local space-times of different species of animals are integrated with each other by integrating inorganic nature as well. That is, if the ways in which the local space-times are differentiated from each other by virtue of their different relations to inorganic nature, then one could use the former differences to reconstruct the spatio-temporal positions of bits of inorganic nature in relation to those of the individual animal. We are not suggesting that anything like this is worked out in detail by Hegel, only that it provides another route (in addition to perception) by means of which inorganic nature – which cannot provide its own space-time – can be spatio-temporally located by reference to animal bodies.

With respect to the second relation – the sex relation (*Geschlechtsverhältnis*) – one of the most interesting things is that it has very little to do with sex differences (*Geschlecht*) and almost exclusively to do with mating (*Begattung*). This is, of course, in accordance with the reduction we have seen, in which we abstract away from the internal form of the animal body in order to treat it quantitatively. But this quantitative relation is made practical through a drive: "As the tension against the inadequacy of [the species'] individual actuality, the species in [the individual] is thus the drive to attain [the individual's] proprioception [*Selbstgefühl*] in another of [the individual's] species, to integrate itself through unification [*Einung*] with it, and through this mediation to merge with the species and bring it to existence – mating [*Begattung*]" (*Enc.* §369). Even in the Addition (*Zusatz*), where he largely repeats Aristotle's understanding of the sex difference, his remarks primarily tend toward showing that the male and the female differ by virtue of the relative prominence of different characteristics which are nonetheless shared by both sexes. But the most obviously quantitative language is in *Enc.* §370, in which the progress of the generations is rendered as the bad infinite, one natural individual after another – but this "after" requires the death of the prior generation. Thus we have points strung together on a line but only by having multiple points overlap: both the mating pair and their offspring.

Of course, as Hegel notes, some animals die almost immediately after mating (e.g., butterflies). But others live a while longer, dying from disease.

The most striking thing about Hegel's discussion of disease is the way he describes it as a disintegration of the organism: "The organism is in a condition of *sickness*, insofar as one of its systems or organs is *excited* in a conflict with inorganic power [*Potenz*], sets itself for itself [*sich für sich festsetzt*] and hardens itself in its particular activity against the activity of the whole, whose fluidity and process which runs through all factors is thereby impeded" (*Enc.* §371). Disease literally stops the flow of time through the animal – stops the processes which we have seen run through all parts of the animal, bringing them together into a special point 0 which is the extended present of the animal. In sickness, one of these systems goes its own way, as it were, and the unique tension in which the animal maintains itself temporally breaks down, which blocks the flow of the whole. The time of the animal becomes purely linear – or perhaps we she should say "continuous" – but at the expense of the animal body itself. It begins to decompose already into the separate timelines of its systems, a precursor to it decomposing into its inorganic nature and the processes proper to that nature.

Hegel presents the dialectic between these moments as the dialectic of fever and recovery in sickness:

> The peculiar *appearance* of sickness is thus, that the identity of the whole organic process presents itself as the *successive* course of the movement of life through its differentiated moments – sensibility, irritability, and reproduction – i.e., as *fever*, which however as the course of the *totality* against *individualized* activity is just as much the attempt and beginning of *healing*. (*Enc*. §372)
>
> *Die eigentümliche* Erscheinung *der Krankheit ist daher, daß die Identität des ganzen organischen Prozesses sich als* sukzessiver *Verlauf der Lebensbewegung durch seine unterschiedenen Momente, die Sensibilität, Irritabilität und Reproduktion, d. i. als* Fieber *darstellt, welches aber als Verlauf der* Totalität *gegen die* vereinzelte *Tätigkeit ebensosehr der Versuch und Beginn der* Heilung *ist*.

The phenomenology here is mundane – fever is both part of the appearance (symptoms) of disease and part of its cure. But the conceptual reconstruction Hegel gives it can be hard to grasp.[10] His point is that fever is, in fact, the intensification of the usual course of life through the different systems of form of the animal. If we are right in our

[10] For a far-reaching interpretation of the importance of sickness and recovery to individual animal life, see Düffel 2006.

reconstruction this far, "movement" is to be taken quite literally – this is the paradigmatic movement because these three systems provide the richest possible coordinate system of an enclosed space. The fact that this movement can be accelerated internally, without any change to the movement outside of it, is one way in which the space-time of the animal is truly local. But it is essential that this movement has been rendered linear in a way not seen in the section on form – it is a "*successive* course" through the different systems. This has both a tendency to separate them off from the tension that defines the present of the animal – it is potentially an escape velocity, to use a celestial metaphor – *and* a tendency to bring them into connection with each other through this greater intensity. If the interconnections can be restored, then the animal heals from the sickness and maintains its special temporal point and enclosed spatial surface.

The remedy is supposed to prod the animal body into healing itself: "The remedy [*Heilmittel*] excites the organism to supersede the *particular* excitement, in which the formal activity of the *whole* is fixed, and to produce the fluidity of the specific organs or systems in the whole" (*Enc.* §373). Hegel has an almost homeopathic conception of the remedy, in which it represents an external version of what is going wrong internally with the animal, which induces the animal to fight against both by getting it to fight off the external version. But the important thing for our theme is the way that it attempts to induce the animal to overcome the blockage that results from all of its activity being concentrated in a specific system or organ, and thus attempts to return the animal to the state of tension between the systems and organs that allowed free movement along all three systematic axes between them (nervous, circulatory, digestive). But the externality is important for the inducement, which is why Hegel emphasizes that they are, strictly speaking, "something indigestible [*ein Unverdauliches*]."

But whatever happens in a particular case of sickness for a particular animal, the general point that Hegel wants to make is that there is always the possibility of death. Conceptually, of course, this possibility arises from the finitude of the animal, which like all finite things is inadequate to its concept. The particular way that this inadequacy is present in the animal is as a contest between the potential concentration of the power of the animal – its "quantitative strength" (*Enc.* §374) – in a single system or organ, and the potential use of precisely that power to overcome an isolated concentration of that strength. This is all made possible by the very nature of nature, which is to be the "free release of the idea's particularity" – that is, to be the sphere in which the possibilities of

multiple realization of every concept are realized. These multiple realizations can take the form of different strengths in different animals – both different species and different individuals – but the same process that generates these different strengths can also go too far and isolate strength in a particular system which then blocks the general movement of life in the animal. Disease and thus the possibility of death are necessary possibilities for the animal. This means that every animal has a temporal and spatial range of linear extent that mark it as an individual.

## 10.4 Conclusion

Perhaps the most remarkable thing about the way in which the Philosophy of Nature comes full circle is the way it becomes as quantitative at the end as it was at the beginning. And in some respects the genesis of this quantitative mode of approach is the same as well: Just as space and time are introduced as simplified ways of representing the mutual externality of logical perspectives developed to a fever pitch of complexity in the Idea chapter of the *Science of Logic*, the genus process reduces the multiple measures and orientations of the animal bodies to points which can then be set into lines – the multiple affine lines of the relations between individual animals, and the Euclidean lines of the generations produced by mating and the lifespan of the animal brought to an end by death. Sickness provides one actual, practical route in which this reduction occurs, and this is why it is the last phenomenon discussed: because it is the actual phenomenon closest to the concept. In sickness, the complex internal tension that generated the special point and enclosed space of the animal comes apart through its own intensification in a limited part of the animal, and thus the integrity of the animal comes to an end. The penultimate phenomenon is mating, in which animals have an implicit relation to the species simply in virtue of the range of their sexual attractions and successful mating partners. Here the complexities of form are reduced to a simple difference – the sex difference – which is how two different space-timelines of two different animals converge at a single point, from which point the space-timelines of their offspring begin. Mating provides the beginning of the lifespan and disease the end. These processes collectively define the space-time of the animal body, which is the paradigmatic space-time for all natural objects. But along the way, Hegel suggests multiple routes – both theoretical and practical – through which the phenomena of inorganic objects can be placed on the coordinate system provided by the animal body. But one must actually say, placed on

the coordinate *systems* provided by animal *bodies*, since in the end we are still lacking any sort of global coordinate system that would come first in the order of either analysis or being. We have instead a network of animal bodies and other natural phenomena, each with their own space-times, existing in determinate relations to each other. If we understand that network *as if* it were an individual body, we generate a globally Euclidean space. But such a space is an abstraction useful for the purposes of doing mathematics, not a metaphysical fact about the world.

CHAPTER 11

# *A Past without History and the Conditions of Life*
## *Hegel on the Terrestrial Organism*

*Ansgar Lyssy*

## 11.1 Introduction

While Hegel's philosophy of nature has received some scholarly treatment, his conception of the earth as a complex organic body – or, as he calls it, a terrestrial organism – has received little attention by commentators.[1] This lacuna is puzzling for two key reasons. First, it is here that Hegel draws a relationship between the mechanical and chemical domains of nature to the domain of living organisms in such a way that he subverts the traditional juxtaposition between inorganic and organic nature – a project of significant philosophical ambition. Additionally, he is one of the few philosophers to reflect on geological knowledge from the vantage point of the philosophy of nature. These two reasons alone merit an examination of Hegel's account of geology.One possible reason for the comparative lack of interest in Hegelian geology might be his dismissal of the major strands of geology. (Throughout this chapter, I use "geology" as a shorthand for numerous branches of the earth sciences.) In his earlier lectures on nature, Hegel claims that geology was nothing but a thoughtless taxonomy of rocks (cf. *Jenaer Vorlesungen zur Realphilosophie*/*JS III*/*GW* 8: 117). Later, in the *Encyclopaedia*, he goes so far as to state that the geohistorical knowledge of the earth's past and its transformations has no philosophical relevance: "All this is a matter of history, and has to be accepted as a fact; it is not the concern of philosophy." (*Enc.* §339A/MM 9: 347/*Enc.* 2P 2: 21). And yet, these dismissals of geology as taxonomic science and as a historical science seem out of place. Hegel devotes a surprising amount of analysis to geological notions in the *Encyclopaedia*: The chapter on the

[1] For example, out of the more recent Hegel dictionaries, only Cobben 2006 contains an entry on geology or earth as terrestrial organism, while Inwood 1992 and Magee 2010 do not.

terrestrial organism with all its additions is more comprehensive than any other chapter in the first part of his philosophy of nature ("Mechanics").[2]

This chapter sets out to make sense of this apparent incongruity. What role is attributed to geological knowledge within the broader whole of the *Encyclopaedia*? Is it simply included for the sake of completeness, rendering its function in the project trivial? Which perspective is adequate to make philosophical sense of geological knowledge? My response to these questions consists in a three-step argument. First, I show that, for Hegel, it is only the temporal notion of geological speculation in terms of geohistory that is irrelevant to philosophy, since as it discusses a geological past that extends beyond human history and thus fails to contribute much to spirit's self-understanding. Second, I argue that geology is nonetheless important as it develops the emergence of forms or formations (*Formationen*, *Bildungen*) and shapes or structures (*Gebilde*) as well as spatio-temporal relations with a particular dynamic that do not have a strict precedent in the domains of mechanical physics and chemistry, even if they arise from them. These formations and structures are not merely geometrical but denote an intrinsic unity of composition and appearance. Mountains or rivers are forms or structures in the sense that they combine a perceptible form with a specific elemental composition. Third, I argue that by means of said emergence of formations and structures and their global arrangement, geology provides us with the basic notion of environment that serves as a precondition for the emergence of organic life. As we shall see, this notion of environment ties in with Hegel's claim that the terrestrial organism serves as the "ground and soil of life" (*Enc.* §347/MM 9: 340).

## 11.2 Past Beyond History: On the Philosophical Relevance of Geology

Before I turn to Hegel's account of geology, I briefly consider the state of geology at Hegel's time and why it *did* matter to other thinkers, historically speaking. At the beginning of the nineteenth century, geology developed in three directions. First, it had a taxonomic bent, according to which different types of rock, sediment, stratum, etc. were distinguished and classified. Second, it sought to uncover the universal regularities that govern the motion of the earth's parts, for example, the motions of tectonic plates, sedimentation, or volcanic eruptions. These regularities

[2] However, the discussion of vegetable nature is twice as long, and that of the animal organism almost four times.

govern the system of the terrestrial body and allow for causal explanations and predictions. Third, it strove to reconstruct the geohistorical past of the earth. Here it engaged in conjectures, that is, it speculated about factual events that are neither the subject matter of proper empirical observation nor something deduced from higher principles. A case in point would be the wide-ranging debate of the time about whether the earth has emerged from fire or water as the primordial substance of all terrestrial matter (the debate between the so-called vulcanists and neptunists).[3] In such reconstruction, different forms of order were interconnected: Geology aimed at identifying the different strata of the earth in their spatial location and to situate such discoveries within a temporal order. The eternal laws that govern geological processes enabled scientists to relate contemporary observations and facts to past and future events alike. Turning the "gaze" of natural history toward the center of the earth permitted them to investigate its past.

This endeavor of producing an evidence-based natural history of the earth is of great importance to the worldview of the nineteenth century. In the seventeenth century, many scholars were following a literalist interpretation of the Bible according to which the earth was created approximately 6,000 years ago (see Rossi 1987).[4] But this view became untenable. Kant, for instance, speculated in 1755 that "a number of millions of years has passed before the sphere of formed nature in which we find ourselves has grown to the perfection that now attends it" (*Universal Natural History and Theory of the Heavens*, *Ak.* 1: 313). Such a claim was increasingly bolstered by geological evidence and the conjectures mentioned earlier. A few examples should suffice here. Some scholars, such as Leibniz, Burnet, and Buffon, had proposed that the earth had once been a boiling ball of liquid material that had cooled down, resulting in a hardened crust of plates floating on a still liquid inner core. By observing how long it takes for molten lava to cool down and harden, one could estimate how long it must have taken the earth's entire crust to cool down and harden in a similar manner. While the results of such calculations varied greatly, they all nevertheless indicated that the earth must have been much older than any calculation based on the biblical

[3] Hegel acknowledges both sides as representing different but interlocking principles that are only formally relevant and one-sided (cf. *Enc.* §339A/MM 9: 344).

[4] Darwin himself makes extensive use of these debates to argue for the possibility of millions of subsequent generations, each involving only minimal mutations: "the number of intermediate and transitional links, between all living and extinct species, must have been inconceivably great" (Darwin 1982, 317).

narrative suggested. James Hutton took up the idea that different strata of stone and other materials would constantly push into each other, providing shifts in geological layers. This would create mountains and cliffs on the earth's surface, which would be gradually eroded by weather and rivers; and the sediment was washed away into the ocean and compacted into stone again. This model was used to create a cyclical and dynamical model of the earth's transformation wherein "we find no vestige of a beginning, – no prospect of an end" (Hutton [1795] 1959, 1:200). The earth's past was not just profoundly older than human existence but also determined by geological revolutions, that is, cataclysmic shifts of surface structures, which led Hutton to speak of a "succession of worlds."[5] Such observations and calculations created, together with their rebuke by creationists such as William Paley, one of the great scientific debates around the turn of the eighteenth century, not only because they challenged the biblical narrative, and thereby the veracity of the sacred text, but also because they informed conjectural history and the role of humans in nature. By reflecting on the processes of fossilization, sedimentation, and erosion, scholars argued for the enormous age of the earth dating back millions and billions of years before human existence. George Cuvier said this discovery of the earth's true age meant to know how to "burst the limits of time" (cited in Rudwick 2005, vi). Hegel is familiar with these debates, but he asserts their philosophical irrelevancy:

> Interesting conjectures may be made about the wide intervals separating revolutions of this kind, about the profounder revolutions caused by alterations of the Earth's axis, and about revolutions due to the sea. In the historical field these are hypotheses however, and this explanation of events by mere succession has nothing whatever to contribute to philosophic consideration. (*Enc.* §339A/MM 9: 348–49; cf. *Enc.* 2P 1: 21)

As indicated by the increasingly comprehensive fossil record, these geological events had caused mass extinctions of unimaginable proportions. Not only were larger dinosaur bones unearthed and collected, but strata such as limestone and chalk contain an enormous number of skeletal remains of small animals, even microscopically small ones, which are often strikingly different from any currently living organism. Furthermore, the size and complexity of the fossils correspond to the type and depth of the geological strata from which they were excavated, indicating that simpler

[5] According to Stephen Toulmin and Jane Goodfield, this meant that the "historical time-barrier was broken" (Toulmin and Goodfield 1982, 159).

species had come into being, went extinct, and bigger and more complex species had emerged later. As human fossils were nowhere to be found, human existence must have been a very recent event, an ephemeral blip on the ever-increasing timescale. Obviously, this posed a profound challenge to the established Christian worldview. Some scholars have compared these insights to other paradigm-shifting scientific discoveries that concerned humankind's place in the cosmos, such as the Copernican Revolution or Darwin's discovery of the descent of humankind (Rudwick 2005, 1; cf. Rossi 1987).[6]

Yet again, Hegel is surprisingly uninterested in all this. He knows about these debates,[7] and yet in this context he writes: "The point of interest is not to determine the conditions prevailing millions of years ago (and there is no need to stint on the years), but to concentrate upon that which is present in the system of these various formations" (*Enc.* §339A/MM 9: 348/*Enc.* 2P 1: 22).[8] While Hegel may grant that geohistory can satisfy natural human curiosity, he does not think that it furthers philosophical understanding.

When it comes to understanding history, the major philosophical task assigned to spirit is to understand itself in its most concrete conception. Spirit is conceptually juxtaposed to nature, albeit it presupposes it and uses it as a means. The appearance of the development of freedom can be conceived in terms of history. For Hegel, history is not just the past but rather "the process whereby the spirit discovers itself and its own concept" (*LPhWH-N* 62). This means that without freedom there can be no history. In geological history, we do not find history proper but merely a pre-Adamitic *past* that lies beyond history. Mere necessity reigns. However, for our understanding of necessity, the natural order that determines contingent things is philosophically irrelevant. The structural determinations that implement this necessity can and should be conceived without regard to temporal order. Put differently, the past beyond history can be conceived in entirely a-historical terms. From a philosophical vantage point, the earth

[6] These debates still reverberate today in the modern rejection of evolutionary theory through creationists.

[7] In the *Encyclopaedia*, he refers to some of the relevant books by Georges Cuvier, Abraham Gottlob Werner, René Just Haüy, and others. For a better survey of Hegel's knowledge of geology, see the annotations to *Enc.* 2P as well as Fritscher 2002, Ferrini 2010, and Levere 1986.

[8] See also Hegel's remark in the 1825–26 lecture on the philosophy of nature: "Indem [das] Interesse vornehmlich auf die Zeit geht, so hat dies Interesse keinen wahrhaften Gehalt. Der Zusammenhang dem Inhalt nach ist nicht der Zusammenhang der Zeit, sondern der der Gebilde nach ihrer Beschaffenheit in sich. Somit die Stellung des Systems im Begriffe ist unser Wesentlicheres" (*VNat2*, 171).

and its process of formation should therefore constitute a timeless totality. Hegel writes: "The sense and spirit of the process is the internal connection [*Zusammenhang*], the necessary relation of these formations, for which the [mere] sequence does nothing" (*Enc.* §339A/MM 9: 348).[9] The typical geohistorical speculations are neither properly empirical observations nor philosophical analyses of actual necessity. The relevant regularities that determine the earth are maintained within the earth and continue to subsist there as a formal universal (see *Enc.* §339A/MM 9: 343–45).

One major task of a philosophy of nature is to articulate how actual objects are spatio-temporally determined. Mechanics understands the earth as a celestial body, distinguished from the rest primarily through its external determinations by other celestial bodies. From a chemical perspective, the earth is an aggregate of different substances and processes, distinguished from other planets through its unique composition and arrangement. The earth is constituted through the unsublated heterogeneity of its parts: The liquid and crystalline forms are not mixed but separated; the surface is structured by separate factors, such as climate, magnetism, or earth's rotation; and so on. On earth, mechanical and chemical factors work together to bring forth a particular form.

However, the philosophical understanding of the earth needs to rely on a posteriori knowledge that is gained through empirical science and, despite Hegel's earlier polemic against the "thoughtless" cataloguing in geological taxonomy, he cannot escape it himself. The mineral composition of the entire earth, as well as its liquid and gaseous aspects, cannot be deduced a priori. However, Hegel is not so much interested in the particular qualities of the minerals but rather in the determinative relations between them. For example, Hegel claims that peat (*Torf*) is a particular that is defined by the fact that it can grow in a vegetable way, but due to its inherent shapelessness, it belongs to the mineralogical realm. Geological taxonomy is sublated in abstract conceptual relations and the empirical import of geology is reduced to the trivial fact that peat is part of the earth's composition.[10] Granite, slate, peat, quartz, etc. are philosophically

[9] Another remark that philosophical considerations should avoid speculations about factual processes of generation can be found in *Enc.* §249: "Der Sinn und Geist des Prozesses ist der innere Zusammenhang, die notwendige Beziehung dieser Gebilde, wozu das Nacheinander gar nichts tut" (MM 9: 348).

[10] It is trivially the case that peat is found on the earth and not on other planets. Nonetheless, Hegel's way of distinguishing geological entities in terms of external and internal determinations would hypothetically allow us to identify alien substances on other planets as peat as well, regardless of their actual chemical composition.

interesting only as they are relevant to the emergence of universal spatial formations such as pebbles, rocks, mountains, or tunnels, as well as to the respective mechanico-chemical processes that facilitate the emergence of these forms. They are nothing but determinations of a holistic process of physical organization (cf. *Enc*. §340/MM 9: 351).

In the following, I develop this Hegelian model further. I take Hegel's philosophy of nature to develop how particularity "fills out" space and, by implication, time.[11] By means of the notion of external determination that is at the core of mechanical physics, space is essentially empty, apart from occasional Newtonian mass-points. Spatial relations are entirely relational and uniform, only cognizable as mere quantities. Chemical space, on the other hand, is developed through internal determination, construed as an arrangement of elemental substances, yet it lacks any order that connects this internal determination to the external determination of mechanics. "Filling out" space is thus a matter of increasingly concrete determinations of spatial relations beyond merely quantitative notions. The earth is conceived through its unique regularities and their determinations of spatio-temporal relations that lead to the creation of geological formations. The notion of geological nature mediates between two interrelated conceptual oppositions and serves a twofold function. Laurent Merigonde speaks of the terrestrial organism as a "double notion," inasmuch as it concerns the organic moment that is contained *within* the inorganic, but also the production of organic life *on the surface of* an anorganic body.[12] This distinction will implicitly play a role in the subsequent argument, but for the sake of reading the terrestrial organism as geological particularity extended in space and time, I propose a slightly different reading. The relevant dichotomy in the notion of geological nature is as follows.

First, the terrestrial organism introduces the notion of organic life. Therefore, it needs to mediate the notion of an instantiation of natural kinds, such as chemical elements, with the relation between individual and species, in which proper individuality becomes possible.[13] It will turn out that the emergence of geological structures and formations from their

[11] This is developed in programmatic form in Kaufmann et al. 2021.

[12] "II y a un double terme à la necessite interne de la differenciation, non seulement dans la forme organique dans l'element de l'inorganique, mais aussi dans la production d'un moment de l'organique qui conditionne la possibilite d'une vie subjective à sa surface" (Mérigonde 2006, 212).

[13] "Das Allgemeine hat sich an ihm selbst zu verwirklichen. [. . .] Das Organische ist gegen sich selbst als dies unmittelbar Allgemeine, als diese organische Gattung gekehrt" (*Enc*. §342A/MM 9: 368). Note that the issue of individualization is also at stake in the account of geology developed in Hegel's 1825–26 lectures on the philosophy of nature (see *VNat2*, 169–76).

chemical elements by means of mechanical interaction will serve as the necessary mediation between two types of individuation.

Second, it is necessary to develop the notion of the earth as a global environment. Life cannot be fully distinct from inorganic matter because this would endanger the unity of nature, and yet it needs to be conceived in opposition to it. Here, the terrestrial organism as the "universal type of life" (*Enc*. §337/MM 9: 337) will serve as the necessary mediation. The terrestrial organism manifests itself as a system of *purposively usable* objects, a system that must precede the functional structures of living organisms. The earth as environment does not yet exhibit any *actual* purposes, but its parts and moments are rather so structured as to lend themselves toward purposiveness. Here we find specific dispositions that are geared toward life.

## 11.3 Mediating between Inanimate Matter and Life

Hegel calls the earth an organism.[14] In the *Encyclopaedia*, organisms are introduced as internally and externally differentiated bodies (cf. *Enc*. §343, 343A/MM 9: 371–73). Both forms of differentiation converge as self-differentiation and self-determination, from which purposiveness and subjectivity emerge. Internal differentiation is produced through a concrete universal, namely the species, which reproduces itself by means of bringing forth individuals whose internal differentiation it provides the structure for. These individuals are numerically distinct insofar as they are externally separated and differentiated through a determinative moment that Hegel calls "particularization" (*Besonderung*). An individual form (a *Gestalt*) emerges that draws both on abstract and concrete forms (*Gebilden*). The organism itself as a self-sustaining entity with its own metamorphosis of growth and decay coincides with the process of the self-actualization of the species. The species is a universal that separates itself into internal and external differences and particularities, all of which are mediated by actual individuals (see e.g., *Enc*. §342A/MM 9: 368–70). The instantiation of a species in the individual body of a plant or animal is significantly different from the instantiation of a chemical element in its individual manifestation, which is a type–token relation. Conceptually, *this* piece of gold is not different from the element of gold that it instantiates, while *this* dog is different from both other dogs and its species in

[14] For a historical account of conceiving of earth in terms of an organism, see Taub 2012.

terms of its actuality and *qua* its self-differentiation and self-determination. It is only the latter relation, the self-sublation of the species into the individual and hence the externality of the species against the separation of individuals, that constitutes organisms as individual entities. While chemical elements are dependent on external factors to produce actual instances of them, organic individuals reproduce themselves by natural means of procreation and thereby reproduce the species; and the species maintains itself through individual procreation. However, such a reciprocity between the species and its individual members and vice versa cannot be derived directly from the way chemical elements are manifestations of universal kinds, as in the chemical process, the universal precedes the individual and remains independent of it. *This* dog is internally differentiated because of its external differentiation, and vice versa. As the earth is a totality, neither internal nor external differentiation have fully manifested themselves *as such*. It is still fully dependent on mechanical and chemical processes that lack the necessary unity for organic life. The earth does not represent this unity to itself.

To understand why Hegel believes himself warranted to refer to the earth as a terrestrial organism, it is helpful to distinguish between (1) an *organism* as a self-sustaining, ordered, and functionally aligned whole that may just as well be devoid of life, and (2) *organic life*, which entails subjectivity and hence a form of self-transparency or rudimentary forms of apperception.[15] The terrestrial organism is an internally and externally differentiated, autopoietic body. Hegel calls the earth a crystal, as it is both an autopoietic process of growth and the product thereof; but in contrast to uniform minerals, it brings forth the double-sided structure of internal differentiation and external determination. Thereby it is incorporating both abstract and concrete parts in the same way as vegetable and animal organisms. Regarding their appearance, there are significant formal similarities between individual organisms and the terrestrial organism that allow us to speak of the earth *as if* it were a living organism. However, the earth can only be conceived of as a totality, and it has no external determination by means of the notion of the species. As a celestial body, the earth is determined by external mechanical forces and hence it has no distinct relation to its externality or environment. Wherein the individual organism can reconcile the difference between internal and external determination as a form of self-determination, in the earth these relations are

[15] The counterpart to this might be spirit, which is alive but not an (individual) organism.

not fully separated in the first place. Hence, it falls short of constituting any proper form of self-determination and subjectivity. While a living organism can bring forth a new actuality by incorporating external entities into its own principle and thereby allows for ordered contingencies, the earth as a totality cannot produce anything new. It already contains everything within its sphere. Without the emergence of something new, there is a past that is governed by necessity but neither history nor life. The earth as an organic structure is not properly alive: Hegel calls it "inanimate" (*totliegend*, *Enc.* §341/MM 9: 360) and "cadaver" (*Leichnam*, *Enc.* §339A/MM 9: 349).[16] Here, organism is separated from life.

I now discuss this distinction between an organic structure and organic life as the terrestrial way in which particularity is realized in time and space. While the chemical process dissolves the tension between aligned or opposing elements by bringing them to an equilibrium that mediates the extremes of the process with each other, the organic process of living organisms is self-sustaining and maintains its parts as themselves, all the while without dissolving their identity within the whole process, as the identity of the whole determines itself internally and thereby maintains the identity of its parts. The earth itself, however, is equally embedded in a tension between its crystalline and liquid parts, which are maintained as themselves without engaging in an all-consuming chemical process. These elements are both causes and effects within this "lifeless" organic process (*Enc.* §338, 338A/MM 9: 342–43) and they lead to a self-stabilizing dynamic that I discuss later. The earth is internally differentiated, like an organism; but like a mechanism, it is indifferent to this internal differentiation.

Importantly, mechanical and chemical processes fail to constitute the natural past as a proper history, as their temporal order can be inverted.[17] When taken as parts of the whole system of the earth, geological processes manifest *order* in their specific way of organizing and thereby fill out space temporally: Erosion, sedimentation, or the growth of crystals are tied to the direction of the arrow of time in the same way as biological growth is unidirectional in time. Mechanism and chemism are bidirectional or time-symmetric, whereas organic self-determination is not.

[16] Stefan Büttner argues that Hegel does not consider the cadaver to be fully opposed to life but rather as a form of negation that still contains life in form of an externality, as the image of life or "life-environment" (Büttner 2001, 82–84). Thereby, however, Büttner conflates life and organism. Cf. also Rühling 1998.

[17] Hegel cites Berthollet, who discovered the reversibility of chemical processes, multiple times in the *Encyclopaedia*.

Chemical elements bring forth their own shapes in time and by means of mechanical processes, and it is one of the tasks of geology to identify and understand this process in its temporal and environmental complexity. For example, water and air, formerly only discussed as elements, become oceans and the atmosphere. They serve to internally differentiate the earth in mutually interacting "spheres," and gain significance and meaning as parts of a habitable world.[18] Furthermore, they are also connected by the circulation of water in the global water cycle (see *Enc.* §341A/MM 9: 362–67). Such a global superstructure creates a nexus of interacting principles and determinations in which clouds are connected to springs, rivers connected to oceans, and ice shelves to global temperature regulation. The motion of tectonic plates would be another such superstructure that connects the different strata with sedimentation processes, mountains to tunnels, etc. In such a dynamic yet globally self-stabilizing system, formations are created whose actuality is resting in themselves yet dynamically interacting with other parts in a more complex system, such as rivers or volcanoes. The totality of the earth determines its parts, but the interaction of the parts shapes the appearance of the totality without determining it. In such a process of internal differentiation, ever more concrete and subtle structures and formations emerge in their respective places and further refine this process of determination through differentiation.

These structures, spheres, and structures are not the results of an independent process that is external to them – this would be to construe them as consequences of mere mechanism. Rather, both structure or shape as products and *structuring* or *shaping* as processes are necessary parts of a more comprehensive process of determination by means of which geological particularity is created: Agglomerations of material substances are developed as layers and strata that pervade the body of the earth and, on the surface, take form as continents and oceans, mountains, plains, and valleys, as sediment and rocks. Chemical composition serves as ground for the determination of the process of taking shape in an increasingly subtle and refined way. We can understand this by analogy with mathematics: A specific formula can be used to create fractals of ever-increasing subtlety by means of repeating structures. In Hegel's geology, the processes of combination and separation of chemical elements are driven by their own framework of sympathies and antagonisms, but the laws of mechanical physics determine their spatial motions. Together, both create the terrestrial globe with an ever-increasing complexity on the surface. In contrast to mechanical

[18] This point is inspired by Ferrini 2010, 125.

determination, this process is largely contingent and in all its details not fully comprehensible (see *Enc.* §339A/MM 9: 349).

The spatial differentiation of the geological process thus happens along two axes of determination: One axis moves from the inside, the planetary core, to the outside, the surface. Here, mechanism is determined by chemistry: The mechanical mass-point is filling out space by means of the aggregation chemical elements that are organized by virtue of gravity as a fundamental power, as well as in accordance with their own framework of chemical alignments and oppositions. The other axis consists in the determination of chemistry by mechanism. The different agglomerations of chemical substances interact mechanically with each other, forming heavier and more uniform strata of metal and rock to lighter and more fine-grained layers of chalk and limestone. Here, the chemical powers of conjunction and separation are fundamental but organized and driven by mechanical forces which bring the physically separated elements into contact with each other, whereby the elemental bodies externally determine one another. Both dynamical developments of determinations give rise to the structures we witness in the planet, which exist in a gradation of a simple and roughly uniform core to an increasingly subtle arrangement of layers and ever more fine-grained formations.

In this process of spatio-temporal determinations, individual structures emerge that provide a distinct relation to abstract and concrete determinations. The structures thus created rely on both in different ways: Silver veins, rivers, and cumulus nimbus clouds are all internally dependent on their respective universals, such as silver, liquid water, and evaporated water. Through external determination, concrete formations, spatial relations, and numerical distinctness become manifest. While Hegel had already discussed the material structure and conditions of different shapes in *Enc.* §310/MM 9: 199–220 (*Die Gestalt*), he had only done so as manifestations of chemical elements. A crystal, for example, has its form due to its internal determination. In his discussion of geology, he conceives the relational interplay of external and internal determinations, thereby placing the conceptual emphasis on the way they are moments of a whole, building on each other *as if* they were to create an ordered whole.[19] (I discuss this apparent teleology later.)

The individual form that mediates the mere instantiation of chemical elements with the functional shape of organisms, their *Gestalt*, is different from the geometrical shape involved in mechanical explanations, as it

[19] The teleology at stake here seems to be entirely formal.

mediately *results* from the reciprocal determination of a body through both internal and external factors. Mechanical shapes are causally connected to their internal composition, and vice versa. By means of the generation of shapes or structures that correspond to the object's internal composition and external determination, the immediate determination that takes place *qua* the chemical elements is sublated into a more complex and concrete form of context-dependent determination that requires us to conceive of it as part of a totality, which however has not yet fully asserted itself as an individual unity. These forms of the earth's subsystems are entirely determined by external and internal causes that are integrated into the external process of geological determination. Hence, they are still lacking self-subsistence and self-containment that are characteristic for and unique to living organisms.

In this process of creating and sustaining isolated and "particularized" structures and formations, internal and external determinations are globally conjoined. The autopoietic generation of the global identity, in which the earth as a specific whole is constituted from an inner vantage point, satisfies the more basic formal notion of life, namely liveliness (*Lebendigkeit*, *Enc.* §341/MM 9: 361), but only insofar as it is conceived of as a totality. This totality reflects back on itself: in a first moment, the earth was conceived as a mere cosmic body, that is, as a product of causal processes. Now it proves itself to be an individuality that acts on itself in an autopoietic way. This tendency for self-determination by means of creating structures in accordance to both internal and external factors is then passed on from the earth as a totality to its particular subsystems, such as the oceans, the atmosphere, the mountains (see *Enc.* §341A/MM 9: 362–67).

It is largely due to such considerations that Hegel conceives of terrestrial matter, which is defined by the different contrasting elements and principles that shape the earth as an organism, as the "possibility of life" (*Enc.* §341/MM 9: 360). Terrestrial matter cannot be juxtaposed to the organisms that inhabit the earth, as this would make the emergence and explanation of life impossible. Consequently, a primitive form of "proto-life" must be ascribed to the terrestrial organism, which is the previously mentioned formal liveliness that emerges from this particular self-organization. It is not the case that an inorganic earth *gives rise* to life, as this would entail the conception of creating life where none was before, thereby positing an irreconcilable opposition between both. The inanimate earth is rather the ground for life, and ground and consequence cannot be fully juxtaposed to each other.

The terrestrial organism cannot fully sublate its own mechanical or chemical nature into its identity. The various chemical elements and parts out of which the earth is composed remain independent and irreducible. Consequently, the organic body always stands on the precipice of returning to its chemical composition and becoming a mere thing (a corpse) defined by its chemical composition, which happens at the moment of death. It is the process of *life* that dissolves this tension between being a self-sustaining unity on the one hand and a merely complicated aggregate of chemical compounds on the other, but it does so only for our (conceptual) understanding of life and not for the organic process of living. Geological life, itself an abstract totality that integrates a tension between unity and aggregate or compound into itself, remains purely speculative (see *Enc*. §337A/MM 9: 338–40). Life will only come to itself fully as an idea (or as spirit). The other three realms (*Reiche*) of life, the mineral realm, the vegetative realm, and the animal realm, are all incomplete "pathways" to such a fully realized life of spirit (*Enc*. §337A/MM 9: 340). In this regard, Hegel's account of geology enables us to push these incomplete "pathways" further back into his analysis, with geology providing the bridge between mechanical physics, chemistry, and organic physics, that is, between the inorganic and the organic. Through the processes of growth, change, and the spatio-temporal situation of mechanico-chemical interaction described earlier, geological formations increasingly resemble organic matter. For example, mountains lose some of their mineralogical qualities, such as their uniform, internally determined structure, as they break through the surface of earth. They start to mechanically interact with their surroundings, all the while still being governed by their internal chemical dispositions, and thereby gain a "particularized" shape or structure and thus arrive at the realm of basic individual entities, that is, mountains "border" on the realm of vegetable entities.[20]

The terrestrial organism is the entirety of these processes that fill out space by constituting structures and particularizations appropriate to the underlying material. These processes generate different geological entities, including the earth's subsystems, such as the atmosphere, the lithosphere, and the hydrosphere, but also the different types of sediments, strata, veins, and rocks. Hegel lends some room to the empirical geological discussions of his time, but he reframes them as the abstract principles

[20] However, individual life needs to be understood as sufficiently independent, as one crucial feature of organisms is that they can ignore some environmental factors in favor of others, and they can actively act back on the environment.

that govern the emergence of particularized formations and structures. The narrative that he reconstructs on basis of geology can be sketched like this. Geological substances are treated as principles which interact and produce a variety of spatio-temporally ordered formations and structures. The simplest of these processes is the interaction of the principle of granite with that of limestone. Granite can be chemically instantiated as pebble, quartz, mica, or feldspar, each with their own distinct dispositional qualities (brittle, flammable, etc.; see *Enc.* §340A/MM 9: 351–53). It is the constitutive material for the surface of the earth, as it contains the basis of metals and crystals, each of which can develop their own shapes. Granite itself is shapeless, but in interaction with other minerals it creates mountains, tunnels, strata, seams (*Flöze*), more rocks and pebbles, and finally more shapeless mixtures such as sand or clay. These formations and mixtures generate other forms and structures, such as veins, grains, cores, or germs (*Keime*). Furthermore, limestone is originally and internally connected (*vergesellschaftet*) with granite. It also is crystalline, which means that it repeats its own structural shape throughout all sizes (see *Enc.* §§315, 315A/MM 9: 217–21). It also contains a sequence of potential transformations, ranging from shapeless marble through shell formations to pebbles, depending on the interaction with other minerals. Mixed with granite, limestone forms mountains and valley, but when left to itself, it takes shapes that appear as if they belong to animals: As opposed to the "vegetable-like" (*vegetabilische*) peat, it "is the calcareousness [*die Kalkformation*] which in its ultimate formations develops into the osseous substance of the animal" (*Enc.* §340A/MM 9: 358/*Enc.* 2P 1: 31). Simple forms emerge that border on animal shapes, such as primitive fossils whose shapes look *as if* they were the results of living organisms. Hegel points out that these emerging structures may look like mussels or fossilized wood but should not be understood as residuals from an ancient animal realm (see *Enc.* §340A/MM 9: 358).[21] They already have the basic shapes of life but are lacking the determinative boundary (*Grenze*) that separates the organism from its environment. These structures are the ultimate form of self-determination of inorganic matter before it sublates itself into organic life properly speaking.[22] The terrestrial organism thus constitutes a

[21] Hegel occasionally conflates fossils with crystals, e.g., *Enc.* §315/MM 9: 220–21.

[22] Karen Ng suggests that the organism is defined by the twofold directedness of the concept, which manifests itself as the outwardly directed and inwardly redirected process of self-production of the organism as an individual and as a member of a species (see Ng 2020, 267–69; cf. also Ferrini 2009a). For this, the individual organism has had to establish some boundaries that separates it from the environment.

"proto-form" of life, namely a crystalline, inanimate organism. It contains the necessary structural determinations for life but not the individuality needed to constitute a minimum of subjectivity that is necessary for life. The earth entails a self-determining process that should be understood as a totality, internally differentiated by means of self-differentiation and self-formation. This duplicity will mediate between our understanding of – to put this in modern terms – physical and chemical determinations on the one hand and biological determinations on the other, between dead matter and living beings. This is why geology does, in fact, play a key role in Hegel's philosophy of nature.

## 11.4 The Earth as "Ground and Soil of Life"

The twofold duplicity of internal and external determinations, as well as that of abstract and concrete determinations, manifests a self-stabilizing structure. Yet subjectivity is only manifest here as a *general* process. It fails to become an individual process and it only acquires its formal particularity in vegetable life as the plant situates itself in opposition to its external surroundings. However, it would be no exaggeration to call this process of emerging subjectivity an inanimate *environment*, as it contains a type of order that is more than just a set of physico-chemical relations. The earth manifests a unique way of "filling out" space and time, even though it is constituted on the basis of physical and chemical relations. It also already contains enough individual externalities that subjectivity can relate itself to in a *meaningful* way, namely for the sake of maintaining and furthering life. The earth then becomes the name for an individual that is uniquely different from all other possible earth-sized physical bodies of the overall same chemical composition that may exist somewhere else in the universe inasmuch as it contains structures that define its *general* (proto-) subjectivity. This subjectivity or liveliness expands through space by taking on the form of different terrestrial subsystems, creating locations and arrangements of particular unities and identities.

Through its self-stabilizing structure, it resembles a functional arrangement of parts and hence manifests a formal teleology. The earth is not properly alive, but it contains a formal liveliness that is not yet fully subjective, and only to a very "puny" degree (*Enc.* §341A/MM 9: 361). This notion of rudimentary liveliness mirrors Kant's notion of purposiveness: It is a concept of formal *as if* relations that are not defined by an immanent subjectivity or end, but the actuality thereof entails the formal structure of directedness all the same. The earth's parts thus are

conceived to be *organs* of a sort. This allows us to understand the self-regulating and interlocking processes of the different systems (geosphere, hydrosphere, etc.) in terms that do them justice, namely as self-regulating, self-stabilizing processes:

> Consequently, the origin of inexhaustible springs ought not to be explained in a mechanical and completely superficial way by means of percolation; volcanoes and thermal springs form another aspect, which is equally unamenable to this interpretation. Just as springs are the lungs and secretory glands by which the Earth transpires, so volcanoes are its liver, in that they represent the spontaneous generation of heat within it. [. . .] Like Naiads, the genuine springs which engender rivers such as the Ganges, the Rhone and the Rhine, have an inner life, endeavour, and activity. The Earth excretes the abstractness of its fresh water, and in these outpourings this water hurries towards its concrete animation, which is the sea. (*Enc*. §341A/MM 9: 363/*Enc*. 2P 1: 36)

This is not merely metaphorical language. The conceptual lens provided by the notion of purposiveness, which entails the formal structure of directedness, captures something true about the earth that would otherwise fail to be adequately conceptualized. As the global whole structures and determines its parts and subsystems, these subsystems come to have *their own place* in that whole, that is, they exist *as if* they were assigned a place.

The dynamical determination of the parts within the whole and in accordance with principles ensures that the shape of things is not fully contingent: Rivers, clouds, beaches, etc. give rise to their particular shapes in accordance to their places within the earth's subsystems. This dialectic of whole and parts present in the earth is nothing but the result of the earth being a totality: We cannot conceive of the earth's subsystems without situating them in relation to the totality. The atmosphere *must* exist on the outside of the lithosphere; the hydrosphere *must* exist on the surface; and it *must* be connected to internal, subterranean springs and superficial rivers, or else the circulation of water would be impossible. The earth's diverging subsystems are both internally determined and externally situated within a greater whole, in the same way as the organs of a living body. Everything is in its place.

Within this process of ever-increasing concretion, the abstract notion of life manifests itself in "punctual and ephemeral" moments of liveliness (*Enc*. §341/MM 9: 360).[23] As such, pseudo-individual structures emerge

[23] "Land und insbesondere das Meer, so als reale Möglichkeit des Lebens, schlägt unendlich auf jedem Punkte in *punktuelle* und *vorübergehende* Lebendigkeit aus; – Flechten, Infusorien, unermeßliche Mengen phosphoreszierender Lebenspunkte im Meere" (*Enc*. §341A/MM 9: 360).

that are *not quite yet* organisms to the extent that they still lack the internal structure of functionality and the capacity for reproduction requisite for something to be a full-fledged organism (*generatio univoca*, see *Enc.* §341/ MM 9: 363). They do constitute the subjective-objective-unity that makes up the foundation of life, even if they are, as merely *punctual* instantiations of subjectivity, lacking the unity of a shape that gives rise to the physical appearance of individuality, that is, the *Gestalt* displayed by organisms. The latter are both dependent on and independent from their environment insofar as they require it for sustenance, and yet they have a certain independence vis-à-vis it, which is seen in how they can favor certain aspects of it over others and actively react to their environment.

Now I sketch how Hegel's notion of terrestrial organism provides a basic notion of environment that builds on the general form of liveliness outlined earlier. Hegel is not developing a notion of environment as an *Umwelt* as it was introduced by Jakob von Uexküll, who defined it as the phenomenally given surroundings of an organism that are broken down into different "carriers of significance" (*Merkmalsträger*), such as chemical signals that point toward nutrition, or sensory effects that indicate changes of temperatures. Such an environment makes it possible for an organism to orient itself, as simple sensory impulses can direct an organism toward the means of survival and away from possible dangers. The organism's phenomenal experience of its surroundings can only take on significance – can only become an environment in this sense of the word – once the organism is on the scene. It adds another layer of meaning to the different shapes and forms that we find on the earth, and geology (in Hegel's broad understanding of the field) alone cannot tell us what this additional layer of meaning is. The modern notion of environment as *Umwelt* is conceived from the vantage point of organic life and Hegel might accuse Uexküll of putting the cart before the horse: All conceptions of organic life *always already* presuppose a conception of the earth as the ordered and dynamic totality of all preconditions of organic life. Without the perspective of life, the carriers of significance are nothing but carriers of *possible* significance at best. This is still an advancement over the merely mechanic and chemical determinations of inanimate matter: By virtue of being part of an internally determinate whole, geological entities, formations, and structures are such that they lend themselves to be such carriers of significance. They do so by relating both chemical elements and physical forces to their respective places. This spatio-temporal and causal order constitutes a formal teleology that facilitates the rise of organic purposiveness. Let me elaborate this point.

An organism is determined by a twofold mereological relation. It is an organized and self-contained whole, yet it also is a part of an environment to which it relates itself and within which it situates itself. The functional alignment of the parts of the organic body thus serves a twofold purpose: When endowed with life, an organ's function is to facilitate the survival and procreation of the individual animal, and it has to do so in a functional relation to an environment. For example, a beak is made for eating *by means of* picking berries; and picking berries is a means for survival. In contrast, a mechanical watch is made for displaying the time, but it has no need for an open-ended, functional, reactive interaction with the environment. However, as such a notion of an organism depends on the notion of an environment, the same holds vice versa: The notion of an environment entails the notion of organic life. The notions of organic life and of an environment thus need to be developed alongside each other. From our vantage point as living beings, the process of the earth formation has concluded. The earth still contains meaningful traces of this process; we can "read" its history from its stones. The distant past has crystallized and has now come to "a state of quiescence" ("Die Geschichte ist früher in die Erde gefallen, jetzt aber ist sie zur Ruhe gekommen," *Enc*. §339A/MM 9: 347). This is a condition of possibility for the emergence of self-sustained organisms, as these can constitute individuality by means of a certain dependence–independence relation to and from the surroundings, which are not mutually dependent on the organism.[24]

As sketched earlier, the subsystems of the earth act as organs and, by virtue of being self-stabilizing parts of an internally determined whole, have unique spatio-temporal determinations to them. An emerging structure such as a mountain, a river, or a beach is conceived as a geological activity of tectonic motion, water circulation, or erosion, such that the form passes over into the product and is sublated therein – a structure or formation emerges. The chemical process is herein dispersed over bodies that have so far only been determined by their mechanical properties, and their appearance is stabilized in time. Thus, the geological entities "fill out" space in such a way that they allow for the conception of bodies that stand in an external relation by means of mechanical arrangements (e.g., one geological stratum pushing at a specific angle at another stratum), while also being conceived in a framework of internal identities, such as chemical elements, compositions, or materials. A river is not only a body of water in a specific shape but it carries minerals, regulates heat, leads to

[24] For a more detailed account of this relation, see Ferrini 2009a.

condensation, facilitates sedimentation, and brings forth different types of mixtures and compositions. This functional role within subsystems can be exploited for the purposes of living beings. The surface of the earth is conceived as a complex topography of mutually determining principles which give rise to dynamic but largely self-stabilizing forms and formations, all of which are interconnected. Hereby, the earth is determined as "ground and soil" wherein ephemeral, punctual moments of liveliness and proto-subjectivity arise. Thanks to this, soil and water have become universally "fertile" (e.g., *Enc.* §341A/MM 9: 365) in the sense that they lend themselves to stable and reliable use through organic beings. A riverbed is fertile not only because it manifests a complex relation between different types of rocks and sediment, water, and air but also because it manifests a dynamic yet sufficiently stable structure that separates itself from other parts of the earth, yet it relates itself to them. Life would not be possible if rocks, water, and air would be kept fully separated and determined only internally or externally. However, the qualities that define the earth are not yet constitutive as an environment, as they have no entity they are represented to *as environment*.

## 11.5 Conclusion

In this chapter, I have argued that geology matters to Hegel's grand philosophy of nature not as a view into the earth's past but as our understanding of how chemical elements interact mechanically, expanding thus in space and time and creating an order in which specific forms and structures are situated at their respective places. The emergence of forms mediates between two forms of individuation and its type–token relation, namely the externality of the chemical element as such against any individual chemical object and the reciprocal dependency of species and individual animals or plants. Then, the emergence of an order in which specific structures are spatio-temporally situated with respect to their internal composition and external causal determination creates a formal teleology that mediates inanimate, causally determined matter with organic purposiveness. As such, the earth comes to be understood as the very ground and soil of life.

The importance of the earth as a geological totality for Hegel is best understood from the vantage point of living beings. That is, the earth exists as an environment *for* living organisms, and since living organisms are dependent on their environment, it precedes them; but this entails that abstracting living beings from the earth is artificial and makes it incomprehensible *as* an environment in the sense of *Umwelt*. Hence, we can see why

geological knowledge plays a pivotal role in the *Encyclopaedia*, despite Hegel's apparent dismissal of geology. There is a necessity to further the conceptual development of the philosophy of nature from the terrestrial organism to the notion of vegetable and animal organism and, beyond that, to the subject. When individual life finally emerges on the earth, it finds its surroundings *as if* they are prepared to be the conditions of life. From the viewpoint of the terrestrial organism, however, it is *as if* nature strives to produce spirit by means of life. But it needs an actual individual organism to which these forms and structures can become transparent.[25]

[25] I would like to thank Joseph Carew for helping me out with the subtleties of the English language, and extend my gratitude to him, Marina Bykova, and the members of Christian Martin's colloquium in Heidelberg in 2021 for their valuable comments.

CHAPTER 12

# *Human Beings as the "Perfect Animals"*
## *Hegel on the Difference between Animal Life and Human Spirit*

*Nicolás García Mills*

The topic of this chapter is the difference between animal life and human spirit, as Hegel construes it in the final section of his Philosophy of Nature, "The Genus Process." My main question in approaching this topic and this stretch of text is: In what way are nonhuman animal organisms "inadequate" or "imperfect" and in what way, correspondingly, are human beings the "perfect" animal, as he tells us? In that final section of the text, Hegel makes the mysterious claim that nonhuman animal organisms "do not accord with the genus [*Gattung*] immanent in [them]" and that this failure to accord with its genus makes for an "inadequacy [*Unangemessenheit*]" and even a "feeling of defect [*Mangel*]" on the part of the individual animal (*Enc.* 2 §369). And the ensuing discussion makes it clear that human beings, which he describes on several occasions as the "perfect animal [*das vollkommene Tier*]" or even the "perfect living organism [*der vollkommene Organismus*]" (*Enc.* 2 §§352A, 370 & A), are supposed to somehow overcome the "inadequacy" or "defect" that afflicts mere animals. My principal objective in this chapter is to clarify the precise sense in which nonhuman animal organisms are "inadequate" (in that they fail to correspond to their genus concept) and the way in which human beings allegedly overcome this "inadequacy" and might thus be characterized as the "perfect animals."

There are at least two reasons that make focusing on the end of the Philosophy of Nature and the question I have just outlined worthwhile. One is that doing so should help us understand the extent to which freedom *qua* self-determination is (and is not) already present in nature, in particular, in the behavior of nonhuman animals. The second reason that makes focusing on the end of the Philosophy of Nature and our question worth our while is that doing so should also help us to better understand the difference between nature (specifically animal nature) and spirit, as Hegel conceives them. Commentators interested in the difference between animal life and human spirit have tended to focus in recent years

on Hegel's Anthropology.[1] This focus on the Anthropology is well motivated, of course, since the official program of that text is precisely to track the transition from the animal soul to human consciousness. By comparison, however, the end of the Philosophy of Nature has been relatively neglected. This neglect is understandable, to some extent. As we will see, Hegel's claims in the final pages of the Philosophy of Nature are extremely cryptic, even by his stylistic standards. But the neglect is also unfortunate. The systematic placement of Hegel's discussion of animal life and human spirit in "The Genus Process," at the point of transition from nature to spirit, should alone suffice to establish the importance of that stretch of text, at least in Hegel's own mind. With this chapter, I hope to contribute to remedying the exegetical situation in which we find ourselves vis-à-vis the final paragraphs of the Philosophy of Nature.

In attempting to elucidate the sense in which nonhuman animals' relation to their genus makes for an "inadequacy" or "imperfection," I am concerning myself with the final rung of the *scala naturae* or hierarchy that Hegel articulates in his Philosophy of Nature. Accordingly, I begin in Section 12.1 by briefly describing what I take to be Hegel's project in the Philosophy of Nature as a whole, and the "Organics" in particular, of articulating such a hierarchy, after which I summarize his general, threefold analysis of the concept of life. Against this background, I then turn my attention in Section 12.2 to that final rung and take a first pass at answering my main question about animals' "inadequacy" and human beings' "perfection." Finally, in Section 12.3, I raise and attempt to respond to several worries to which my discussion of Hegel on the difference between animal life and human spirit gives rise.

## 12.1 The Philosophy of Nature and the "Organics"

Hegel's Philosophy of Nature is rich with detailed discussions of particular scientific theories as well as the natural phenomena that those theories study (from Newtonian mechanics to meteorology, geology, botany, or physiology). Unfortunately, when it comes to describing the overall topic

[1] See e.g., Lumsden 2013, Nuzzo 2013, Testa 2013, and Novakovic 2017a.

and aim of the Philosophy of Nature itself, Hegel is considerably terser.[2] In one of the passages in which Hegel does take up such methodological issues, in the introductory paragraphs to the Philosophy of Nature, he tells us that nature consists of a "system of stages [*System von Stufen*]" (*Enc.* 2 §249). The Philosophy of Nature, I propose, is accordingly meant to track the conceptual underpinnings or the series of natural forms that underlie the phenomena that make up each of the "stages" in question.[3] But in what sense is each point within the "system of stages" supposed to represent the "truth" of its immediate predecessor, as Hegel also tells us? Otherwise put, how is the series of natural forms that the Philosophy of Nature tracks supposed to form a hierarchy or ordered series, a *scala naturae*, as I have already suggested, such that the later members of that series are somehow "higher" than their earlier counterparts?

Hegel gives us a clue to the answer to the question I have just posed when he suggests that the Philosophy of Nature as a whole can be regarded as a process whereby "externality" is gradually overcome. In the introductory paragraphs to both the Philosophy of Nature and the Philosophy of Spirit, Hegel tells us that the "determinacy [*Bestimmtheit*]" that characterizes nature as such is "externality [*Äußerlichkeit*]" (see especially *Enc.* 2 §248 and *Enc.* 3 §381A). And in the recapitulation of his treatment of nature that we find at the outset of the Philosophy of Spirit, Hegel explicitly describes the aim of the Philosophy of Nature as the "overcoming of externality [*Überwindung der Äußerlichkeit*]" (*Enc.* 3 §381A).[4] In that same context, he characterizes nature *qua* realm of externality as follows:

[2] A lengthier, more detailed counterpart to the story I go on to briefly summarize would go by way of a discussion of the three "attitudes" towards nature with which Hegel opens the Introduction to the Philosophy of Nature. For an excellent, recent treatment of this material, see Martin 2022.

[3] There is a split within the literature on Hegel's Philosophy of Nature between those commentators who maintain that Hegel is in the business of providing a pure or a priori deduction of those natural forms and the commentators who deny this interpretive claim (either because they take Hegel to be more modestly providing an a posteriori reconstruction and systematization of the results of the natural sciences or because they take the distinction between the a priori and the a posteriori itself to be one that Hegel calls into question). Within the first camp are Stone 2005, Houlgate 2005, chapter 5, Martin 2021 and 2022. Burbidge 1996, Rand 2007 and 2017, Pinkard 2004 and 2012, chapter 1 are representatives of the second camp. Fortunately for my purposes in this chapter, I do not need to attempt to settle the interpretive dispute between these camps here.

[4] Hegel elaborates on this theme in *Enc.* 3 §389A: "The philosophy of nature teaches us how nature sublates its externality by stages, how matter already refutes the independence of the individual, of the many, by *gravity*, and how this refutation begun by gravity, and still more by simple, indivisible *light*, is completed by animal life, by the sentient creature, since this reveals to us the omnipresence of the one soul at every point of its bodiliness, and so the sublatedness [*Aufgehobensein*] of the asunderness [*Außereinander*] of matter."

> We know that what is natural is spatial and temporal, that in nature this stands next to that, this follows after that, in short, that everything natural is mutually external ad infinitum [*alles Natürliche ins Unendliche außereinander ist*]; further, that matter . . . holds itself asunder [*sich auseinanderhält*] against its own self, divides itself into concrete points, into material atoms, of which it is composed. The differences into which the concept of nature unfolds are more or less mutually independent existences [*Existenzen*]. (*Enc.* 3 §381A)

As the passage about the externality of nature that I have just quoted has it, nature, in particular merely material or mechanical nature, is "external" to the extent that it is made up of material parts whose behavior is determined by their interactions with other "independent existences." Simplifying a much longer story, we might say that the "externality" of nature is correspondingly overcome to the extent that the behavior of natural phenomena is explained not by any action from without but by appeal to the universal or concept under which those phenomena fall. According to this criterion, animal organisms represent the highest point that nature can achieve, that is to say, the final rung of the natural hierarchy or ladder. For unlike the behavior of merely material nature, animal organisms' vital processes are guided by ends that are their own or issue from their genus concept. In other words, nonhuman animals' behavior is explained by the concept or universal under which those animals fall to a greater extent than is the case for phenomena belonging to the lower "stages" of nature. As Hegel reportedly states: "It is only in *life* that we meet with . . . the counter to externality" (*Enc.* 2 §248A).[5] Nonetheless, even an individual animal organism, Hegel tells us, is "inadequate" in that it "does not accord with the genus immanent in it" (*Enc.* 2 §369). That animal life does not completely overcome the externality of nature, or that the behavior of nonhuman animal organisms is not completely explained by the genus concept under which those organisms fall, as I have also put it, is evident from Hegel's remark that life is "at the mercy of the unreason [*Unvernunft*] of externality" (*Enc.* 2 §248R) or from his reported claim that "in animal life the concept does not attain to an actuality [*Wirklichkeit*] resembling its soulful essence, to the complete overcoming of the externality and finitude of its reality [*Dasein*]" (*Enc.* 3 §381A).[6]

[5] See again §381A as well, where we read that "in the animal body the complete untruth of asenderness [*Außereinander*] is exposed."

[6] I take Stone (2018, 134–35) to be summarizing the characterization of the Philosophy of Nature that I have just sketched when she writes: "Hegel thus regards nature as a rationally organized realm in which matter gradually becomes shaped and organized by 'the concept', in the process assuming organic form. In that nature exhibits this progression towards organism, all natural forms approximate to organic status to varying degrees (down to a vanishingly low degree in mechanism)."

Before taking up the issue of nonhuman animals' "inadequacy" and human beings' "perfection" in the following sections, I summarize Hegel's threefold analysis of the concept of life, which will serve as the background for our subsequent discussion. Briefly, animal organisms, for Hegel, are complex causal systems whose parts and whole are reciprocally determined. In particular, each, parts and whole, is simultaneously cause and effect. As Hegel supposedly puts it: "As its own product . . . animal life is end and means simultaneously" (*Enc.* 2 §352A). The individual parts of an animal organism are causally dependent on other individual parts, and ultimately on the organism as a whole, for their proper functioning. Animal life is thus a means to the proper functioning of its parts. But animal life is also an end, as we have just seen in Hegel's quotation. The individual parts are also causally responsible for the subsistence of the whole. By cleansing our blood, for example, our liver causally contributes to the survival of the organism to which it belongs.

Hegel adds to this general characterization of animal organisms as teleological systems by describing them in terms of three, more specific processes or operations. The first, "shape process" or "formation process [*Gestaltungsprozess*]," comprises the set of operations of the blood, nervous, and other physiological systems, whereby the organism relates to its own body parts without consideration of these parts' interaction with the organism's external surroundings. From the point of view of this first process, the organism "only relates to itself," Hegel writes (*Enc.* 2 §352). The second, "assimilation process," comprises both the "theoretical" operations (sensations) and the "practical" operations (e.g., respiration or nourishment), whereby the animal relates to its external surroundings. In this second process, Hegel tells us, the organism "relates itself to its other, its inorganic nature" (*Enc.* 2 §352). Finally, the third, "genus process [*Gattungsprozess*]," consists in the production, by some members of an animal species, of other individuals of the same kind or with the same complex causal structure. This third process represents the "unity" of the previous two, as Hegel notes in §346, in that the animal "relat[es] to an other which is itself a living individual, and thereby relat[es] itself to itself in the other."[7] To bring together the different pieces of Hegel's description

[7] In his treatment of vegetable organisms, Hegel describes this "triad of processes" as follows: "[T]he *first* . . . is the universal process, the process of the vegetable organism within itself, the relation of the individual to itself . . . *Secondly*, the organism has its other, not within it, but outside of it, as a self-subsistent other . . . That is the specialized process towards an external nature. The *third* is the process of the genus, the union of the first two; the process of the individuals with themselves as genus, the production and the preservation of the genus – the destruction of the individuals for the preservation of the genus as production of another individual" (*Enc.* 2 §346A). Although this passage

of animal organisms in a brief statement: For Hegel, animals are causal systems that are teleologically structured, both (1) internally and (2) externally or in their relations to the environment, so as to guarantee their own survival or individual preservation as well as (3) their reproduction or the preservation of the species.

## 12.2 The "Perfect" and "Imperfect" Animal

The hierarchical structure of the Philosophy of Nature as a whole, whereby "externality" is gradually overcome, also applies to the "Organics" and Hegel's discussion of animal life therein. It is on this final rung of his *scala naturae* that I focus in the rest of the chapter. To make my task more manageable, I divide our general question about the "inadequacy" of nonhuman animal organisms and the "perfection" of human beings into three more specific questions and take a piecemeal approach. The three questions are: (1) In what way is any nonhuman animal "inadequate" or "imperfect"? (2) In what way are human beings, in contrast to their nonhuman counterparts, the "perfect animals"? And (3) in what way does the human being qua "perfect animal" serve as a "standard" or "archetype" by which the "lower grades" of animal life are to be judged? I take up each of these questions in turn in this section. I then turn, in Section 12.3, to several objections and rejoinders to which my discussion gives rise.

(1) It is by now widely (even if not unanimously) accepted among Hegel commentators that individual animal organisms and their parts are normatively evaluable, for Hegel, in the light of some internal, species-specific standards. A three-legged gazelle, for example, is defective or not as it ought to be in this internal, species-specific way, in Hegel's view.[8] But Hegel also seems to maintain, more bizarrely, that all animal organisms, including healthy, well-functioning organisms such as four-legged gazelles, are in some sense "inadequate" or "defective." In a passage I have already partially quoted, Hegel writes of nonhuman animal organisms that "the individual as a singular does not accord with the genus immanent in it"

strikes me as comparatively clearer than others, similar statements of the "triad of processes" can be found in the chapter on animal organisms (specifically, §§352 & A). For discussions of the same material in Hegel's Logic, see §§217–22 of the *Encyclopaedia*.

[8] More specifically, as I understand Hegel, a three-legged gazelle is defective in that it lacks a feature without which its species would not have been able to survive and reproduce to give rise to that individual three-legged gazelle. For more on Hegel on the normative evaluability of animal organisms and their parts, see Kreines 2013 and 2015, chapter 9, Alznauer 2016, and Garcia Mills 2020. For the view that animal organisms are not evaluable in the way I have just indicated, according to Hegel, see Rand 2015.

(*Enc.* 2 §369). He then turns to a discussion of copulation or the "sex-relation [*Geschlechtsverhältnis*]" as a way to allegedly solve the problem or "inadequacy" he has just diagnosed.[9] But what exactly is problematic about the way in which nonhuman animals bear their genus such that they are thereby rendered "inadequate" or "defective," as Hegel tells us? And in what way is a discussion of copulation supposed to help with the problem?

We find Hegel's own, summary answer to the first of the questions I have just posed in the *Zusatz* to §369:

> The contradiction [between individual animals and their genus] is . . . that the universality of the genus, the identity of individuals, is distinct from their particular individuality; the individual is only one of two [sexed individuals], and does not exist as a unity [with its genus] but only as a singular. (*Enc.* 2 §369A)

As I understand Hegel's discussion at the outset of "The Genus Process," the problem that underlies the "inadequacy" charge is the following. Natures or essences are not sexed – for example, the horse as such, the nature or genus that Bucephalus, Babieca, and Phar Lap all share, is neither male nor female. As we know at this point in the text from Hegel's foregoing discussion of animal life, a description of the genus horse, or any other animal nature, includes a description of the ways in which that genus or life-form reproduces, along with descriptions of the way in which it assimilates its environment and the way in which it is internally structured. Bucephalus, Babieca, and Phar Lap, however, precisely because they are sexed, cannot satisfy the description that articulates the content of their genus. And the point generalizes. It is supposed to be true of any individual, sexed animal organism that bears some genus or other that it fails to meet at least some of the conditions that make up the content of the genus in question, namely, those conditions pertaining to reproduction. Insofar as it fails to meet at least some such conditions, the individual animal organism "does not accord with the genus immanent in it" and so is "inadequate" or "imperfect."

The way of parsing nonhuman animals' "inadequacy" that I have just sketched anticipates the role that copulation is supposed to play in its remedy. In reproducing via copulation, healthy, well-functioning, sexed

[9] The passage from §369 that I have partially quoted reads in full: "[T]he individual as a *singular* does not accord with the genus immanent in it, and yet at the same time is the identical self-relation of the genus in *one* unity; it thus has the *feeling* of this defect. The genus is therefore present in the individual as a straining against the inadequacy of its single actuality, as the urge to obtain its self-feeling in the other of its genus, to integrate itself through union with it and through this mediation to close the genus with itself and bring it into existence – *copulation* [*Begattung*]."

animal organisms realize their genus. Through the process of copulation, male and female animal organisms come to jointly meet the conditions that make up the content of their genus and which they cannot meet or satisfy on their own. As Hegel reportedly puts it:

> [B]oth sides [of the process] are organisms and belong to the genus, so that they exist only as *one* sex [*Geschlecht*]. Their union is the disappearance of the sexes into which the simple genus has developed ... The process consists in this, that [the individuals] become in reality what they are in themselves, namely, *one* genus ... (*Enc.* 2 §369A)

Of course, as Hegel also quickly notes, the appeal to copulation only raises a further problem. Because the process of reproduction via copulation engenders new, sexed individuals, "the sublation of the contradiction" (i.e., the lack of correspondence between the individual animal and its genus) "is always the beginning of a new [contradiction]" (*Enc.* 2 §369A). Consequently, in the case of nonhuman animals, the genus exists only as a "spurious infinite progress [*schlechte Unendlichkeit des Progresses*]" (*Enc.* 2 §369). The progress is "infinite" because each point in that progress or series "engenders a new [contradiction]" that calls for yet a further step to resolve it. The progress is "spurious" (or "bad") because no matter how far along in the series we might be, the individual animal organism at that point in the series fails to accord with its genus and is therefore "inadequate."

(2) Hegel's discussion of sexual difference and reproduction invites an obvious objection, namely, that not all animals reproduce sexually or are even sexed, which I address in Section 12.3. For now, I turn to our second question: How do human beings avoid the "inadequacy" that Hegel argues afflicts other animals? In what sense, that is, are human beings the "perfect" animals? To answer this question, we need to understand how our genus, namely, spirit, and our relation to our genus, differs from that of other animals. Toward the end of the Philosophy of Nature, Hegel seems to speak interchangeably, and without elaborating, of spirit, thought, and consciousness.[10] Just a few paragraphs after his discussion

[10] See for example *Enc.* 2 §376A, where whatever else Hegel is claiming, it seems clear he is identifying spirit, consciousness, and thought: "[I]n locomotion the animal is completely liberated from gravity, in sensation it feels itself, in voice it hears itself; in the genus-process the genus exists, but still only as a singular. Now since this existence is still inadequate to the universality of the Idea, the Idea must break out of this circle and by shattering this inadequate form make room for itself. Therefore, instead of the third moment in the genus-process sinking back again into singularity, the other side, death, is the sublating of the singular and therewith the emergence of the genus, the procession of *spirit*; for the negation of natural being, i.e. of immediate singularity, is this, that the universal, the genus, is posited and that, too, in the form of genus. In the individuality, this movement of the two

of the "genus process" at the end of the Philosophy of Nature, he is more forthcoming. At the outset of the Philosophy of Spirit, he tells us that the essence of spirit is freedom, which he describes as an ability to step back or abstract from our sensations, needs, desires, from anything that belongs to our biological makeup or organic life. He writes: "[F]ormally the essence of spirit is freedom ... In accordance with this formal determination, the mind can abstract from everything external and from its own externality, from its very life ... This possibility is its intrinsic abstract universality" (*Enc.* 3 §382).

Hegel's claim about freedom in this passage in no way flies in the face of his remarks about spirit toward the end of the Philosophy of Nature, where he appears to equate spirit with the capacity for thought or consciousness. For, as the description of freedom in terms of an ability to "abstract from everything external" or natural suggests, freedom has as a necessary condition or otherwise includes thought, understood precisely as a capacity for a certain kind of abstraction or reflection. Because our relation to the genus, life-form, or universal that we bear is mediated by thought and so reflection, Hegel adds, that universal can become an object for us. As he puts it in the course of his discussion of copulation: Its genus or "its concrete universality never becomes for [the animal] a theoretical object of intuition: else it would become thought, consciousness" (*Enc.* 2 §369A). Moreover, Hegel maintains that our making the genus or the universal that we bear an "object of intuition" is somehow connected to the way in which that genus is realized. To put this latter point somewhat more precisely: The fact that we are free creatures capable of treating our genus as an "object of intuition" has the consequence, for Hegel, that our existence as free creatures is in part a function of our taking or knowing ourselves to be free. In other words, human, spirited creatures make themselves what they are or give themselves an existence as free beings on the basis of their knowledge that they are essentially or by nature free. Hegel is perhaps at his most perspicuous on this point in his *Lectures on the Philosophy of History*, where he is reported as saying: "Spirit knows itself: it is the judging of its own nature, and at the same time it is the activity of

sides is the process which sublates itself and whose result is *consciousness*, unity, the unity in and for itself of both, as self, not merely as genus in the inner concept of the singular. Herewith, the Idea exists in the self-subsistent subject, for which, as organ of the concept, everything is ideal and fluid; that is, the *subject thinks*, makes everything in space and time its own and in this way has universality, i.e. its own self, present within it ... *Thought*, as this universal which exists for itself, is immortal being; mortal being is that in which the Idea, the universal, exists in an inadequate form" (emphases modified).

coming to itself, of producing itself, making itself what it is in itself [*an sich*]" (MM 12: 31).[11] None of the features I have just outlined – freedom, thought, the ability to make oneself what one is essentially or by nature – are supposed to hold of other, lower animals, in Hegel's view.[12]

Against the background of the foregoing discussion, we can now take a pass at answering the question: How do human, spirited beings overcome the "inadequacy" that Hegel believes afflicts nonhuman animals and the way in which they relate to their genus? The content of a (nonhuman) life-form or genus articulates the set of conditions that individuals bearing that genus must satisfy in order to qualify as sound, nondefective members of that life-form. But, it turns out, all sexed, individual animal organisms fail to satisfy at least some of those conditions and are to that extent "inadequate." The first thing to note in response to the question we are now tackling is that sexual difference does not play the same role vis-à-vis our genus, and the relation that we have to it, that it plays in the case of other animals. The fact that we are male or female is (or should be) irrelevant from the point of view of the exercise of the capacity for thought and the realization of freedom.[13] Thus, if sexual difference is supposed to be the source of the "inadequacy" that Hegel identifies, then that "inadequacy" should not be one that affects the way human, spirited beings relate to their genus.

More generally, because the universal that we bear, and our relation to it, is unlike that of any other, nonhuman animal, there can be no gap in principle between that universal (i.e., freedom) and the way in which the universal is realized in individual human beings. For Hegel, what we are as

[11] Hegel puts the point much more tersely in discussing the transition from nature to spirit at the very end of the Philosophy of Nature: "[B]ecause spirit . . . is itself its object, it is inseparable from its reality [*Realität*]" (*Enc.* 2 §375A). See also *Enc.* 3P 1: 6–7, where he elaborates: "[I]f we ask what spirit is, the immediate answer is that it is [the] motion, [the] process of proceeding forth from, of freeing itself from nature; this is the being, the substance of spirit itself . . . [I]t is of the very nature of spirit to be this absolute liveliness, this process, to proceed forth from naturality, immediacy, to sublate, to quit its naturality, and to come to itself, and to free itself, it being itself only as it comes to itself as such a product of itself; its actuality being merely that it has made itself into what it is."

[12] Although nonhuman animals cannot grasp their genus concept or have the universal they bear as an object of theoretical awareness, they do have some sort of sensory intimation of that genus, according to Hegel. That sensory intimation is manifested in the different ways in which they seek out and relate to members of their genus, on the one hand, and to the rest of their environment, on the other. Animals, for example, breed with other members of their genus but flee from or perhaps attack members of other species. As Hegel reportedly puts it at the outset of the *Philosophy of Spirit*: "The animal only senses [*empfindet*] the genus, it is not aware of [*weiß nicht von*] it; in the animal . . . the universal as such is not for the universal" (*Enc.* 3 §381A).

[13] But see Hegel's discussion of the division of social roles within the family in the *Philosophy of Right* (§§165–72). On this issue, see also Stone 2018, chapters 11 and 12.

free beings is a function of what we take ourselves to be. As we have just seen, as spirited creatures, we make ourselves or give ourselves an existence on the basis of our knowledge of our essence or nature as free beings. And to the extent that we make ourselves what we are essentially or by nature, it is within our power, for us spirited creatures, to fully realize our genus. Because spirit produces itself or gives itself its own reality, spirited creatures are not inadequate in the ways that other, nonhuman animals are. That is to say, individuals can accord in the human, spirited case with the universal or "genus immanent in them" (*Enc.* 2 §369).

That human beings can realize their concept fully or without remainder, it is worth noting, implies neither (i) that I can enjoy whatever existence I wish just by entertaining some self-conception or other, nor (ii) that our essence, freedom, is compatible with any existence whatsoever or sets no constraints on its realization. Realizing the freedom that we essentially enjoy requires in part that we pursue some set of particular ends that we might have as, for example, sculptors, philosophy teachers, or amateur chess players. But it is clearly not sufficient to my having an existence as a sculptor or philosophy teacher that I simply entertain the respective self-conceptions. In order to enjoy such an existence, it is in addition necessary that I act in ways that are confirmatory of those self-conceptions and that I be socially recognized as having an existence corresponding to such self-conceptions. That our essence as free beings places certain constraints on its realization can be easily appreciated by noting that practical freedom is incompatible in Hegel's mind with an existence as a slave owner or a petty thief, for example.

(3) Finally, and against the background of our discussion of the way in which we relate to our essence as free beings, we can now ask: In what way do human beings, understood as spirited or free beings in the manner I have described, serve as a "standard" or "archetype" by which the "lower grades" within Hegel's hierarchy of life forms, and specifically animal life, are to be judged and understood? In the *Zusatz* to the final paragraph of the Philosophy of Nature, Hegel confesses that his aim in the foregoing lectures has been to find in nature "only the mirror of ourselves," that is, "to see in nature a free reflex of spirit" (*Enc.* 2 §376A).[14] Taking our lead from this remark, we might try to give the following answer to our third

[14] In the introductory paragraphs to the Philosophy of Nature, we read along similar lines: "The thoughtful [*denkende*] consideration of nature must consider how nature is in its own self this process of becoming spirit, of sublating its otherness [*Anderssein*]" (*Enc.* 2 §247A).

question: To the extent that we are capable of abstracting from our sensations, desires, and drives and are thus free, we are, Hegel tells us, "with ourselves," by which he means that we are not determined by anything "external," outside ourselves, or "other."[15] Nonhuman animals are certainly not capable of abstracting from everything "external" in the same way. Unlike ours, their behavior is governed by their instincts or drives. Nonetheless, we can understand (nonhuman) animals' behavior as approximating or "mirroring" humans' ability to be "with themselves," as the passage I have just partially quoted suggests. Unlike inanimate or merely material nature, animal organisms are not just governed by forces outside themselves. Their behavior and vital processes are guided by ends that are their own or issue from their genus concept. To the extent that mere animals' behavior is susceptible of explanation by appeal to such genus-specific ends and not by appeal to outside forces, that behavior is self-determined and animals are *bei sich* or "free." Thus, understanding ourselves as free or self-determining creatures supplies us with a standard in the light of which we can understand and appraise the extent to which nonhuman animals and other parts of nature are (and are not) also self-determining.

Moreover, and in line with the general characterization of the project of the Philosophy of Nature that I sketched in Section 12.1, the lesser and greater freedom enjoyed by nonhuman and human animals, respectively, is supposed to track the extent to which each of their behaviors is explained by their concept or universal, in Hegel's mind. Our behavior is supposed to be completely explained by that concept, namely, freedom, whereas the behavior of other animals is only incompletely explained by their genus concept, in ways that the discussion of their "inadequacy" has hopefully helped to capture. That genus concept would be completely explanatory of the behavior of its bearers only if the latter corresponded fully to that concept, that is to say, only if they exhibited all the features that the concept comprises. But, as we have seen, all nonhuman animal organisms, even healthy, well-functioning specimens, fail to meet at least some of the conditions that make up the content of the genus that they bear, according to Hegel's discussion in "The Genus Process."

[15] Hegel characterizes freedom as the absence of determination by an external "other" perhaps most perspicuously in the context of his discussion of the will in the Introduction to the *Philosophy of Right*. He there writes that an entity is free just in case it is "completely with itself [*bei sich*] because it has reference to nothing other than itself, so that every relationship of dependence on something *other* than itself is thereby eliminated" (*PR* §23).

## 12.3 Objections and Rejoinders

Having taken a first pass at answering our question about nonhuman animals' "inadequacy" and human beings' "perfection," I turn in this section to several objections that my discussion so far invites. The first objection targets Hegel's treatment of sexual difference and reproduction; the second objection asks about the role of biological death within Hegel's discussion of the "genus process"; the third objection has as its focus the role that our animality is supposed to play in Hegel's characterization of human, spirited beings as the "perfect animal" or the "perfect living organism"; the fourth and final objection concerns the connection between Hegel's Philosophy of Nature and his Anthropology. I address each of these objections in turn.

The first and perhaps most obvious objection to which my interpretive proposal in Section 12.2 gives rise concerns sexual difference and reproduction. Hegel's way of spelling out the "inadequacy" that afflicts nonhuman animal organisms, as I interpreted it, turns on the claim that animals are differentiated and reproduce sexually.[16] That claim, however, does not appear to be true of all or only animals. How, then, is Hegel supposed to account for the fact that not all animals reproduce via copulation or are even sexed? Hegel's answer, I suggest, would be that animal organisms that do not reproduce sexually are, to that extent, plant-like. Plants and their parts appear to be both cause and effect, or "end and means simultaneously," as we saw Hegel say about animal life. The main difference between plants and animals, on Hegel's account, is that (1) plant parts can typically subsist apart from the whole to which they originally belong and (2) the causal role of some part within the whole can frequently be carried out by other parts, thereby guaranteeing the continued existence of the whole. A branch, for example, might break off, take root, and continue to subsist and grow apart from the organism to which it belonged. And the original function of the branch in that whole might in turn be taken over by any number of other parts.[17] I take Hegel

[16] Lindquist 2020 offers a reading of Hegel on the "genus process" that intends to sidestep his claims about sexual reproduction (or reproduction generally, for that matter). Whatever the merits of Lindquist's interpretation as a reading of the chapter on life in the Logic (see §220 of the *Encyclopaedia*, however), the passages I quote in Section 12.2 from §369 and the accompanying *Zusatz* seem to me to be hard to square with such an interpretation.

[17] For more on Hegel on plants see Matthias Haase's manuscript "Vegetation and Individuation: Hegel on the Life of Plants" and also Stone 2018, chapter 12.

to be making these points, (1) and (2), in his discussion of plant life when he writes:

> [1] [T]he process whereby the vegetable subject differentiates itself into distinct parts and sustains itself is one in which it . . . falls apart into a number of individuals, the whole plant being rather the basis [*Boden*] for these individuals than a subjective unity of members; the part – bud, branch, and so on, is also the whole plant . . . [2] [T]he *difference* of the *organic parts* is merely a superficial *metamorphosis*, and the one part can easily assume the function of the other. (*Enc.* 2 §343)

Hegel makes the first point, (1), perhaps most clearly in the introduction to the "Organics": "[E]ach plant is only an infinite number of subjects, and the connection whereby these subjects appear as a single subject is merely superficial. The plant is unable to maintain its power over its members, for they detach themselves from it and become independent" (*Enc.* 2 §337A). For animals to reproduce nonsexually is for them to be plant-like, as I have mentioned, in that (1) one of their parts is separated and continues to exist apart from the whole to which it belonged. In the case of the nonsexual reproduction of animals, that is, it is true of them as it is of plants that "the part . . . is also the whole" or that, as Hegel also says, "[the parts] detach themselves from [the whole] and become independent."[18]

[18] Reproduction, in the case of plants as I have so far described them, is a matter of outgrowth. A branch grows, "detaches itself" or breaks off, and takes root. In some plant species, the outgrowths even share the same root system as the original host plant, a circumstance that in Hegel's mind speaks to the inseparability of the vital processes of formation and reproduction in plant organisms. As he tells us, in the case of plants, "the process of formation and assimilation is itself already reproduction as production of new individuals" (*Enc.* 2 §348). That the processes of formation and assimilation are similarly inseparable is evident from the fact that plants take in nutrients, for example water, through growth or by extending their parts in the direction of those nutrients. Hegel notes that "the process of formation, the diremption [*Diremtion*] into root and leaf is itself a diremption into the direction of earth and water and that of light and air: into the absorption of water and its *assimilation* through the intermediation of leaf and bark and of light and air" (*Enc.* 2 §347). But what about sexual reproduction in plants? Hegel concedes that pollination is "a beginning and an adumbration of the genus process" (*Enc.* 2 §348) proper, distinct or separate from the formation and assimilation processes. Nonetheless, according to his account of plant life, reproduction via pollination is best understood as the combination of parts belonging to the same whole and not, as in the case of copulation, as the behavior of two individual organisms that relate to each other as members of the same genus and differently from the way in which they relate to the rest of their environment. In the context of Hegel's discussion of pollination, we read: "[T]he sides of the [sexual] relation are not two individuals. There are only a few plants where the difference of sex occurs in such a manner that the separate sexes are distributed in two separate and distinct plants" (*Enc.* 2 §348A). Thus, some plants mark a step towards higher forms of life. For the most part, however, plants fail to fully exhibit the complex structure that is distinctive of living things, as points (1) and (2) in the body of the chapter and the inseparability of the three vital processes suggest.

The second objection, to which I now turn, draws attention to the role of biological death in Hegel's discussion in "The Genus Process." That death plays some important role in Hegel's discussion is evident from passages such as the following, which we find in the context of his remarks about copulation: "The genus preserves itself only through the destruction [*Untergang*] of individuals who, in the process of copulation, fulfil their determination [*Bestimmung*] and, insofar as they have no higher determination, in this process meet their death" (*Enc.* 2 §370). A few paragraphs later, Hegel writes: "[The animal's] disparity [*Unangemessenheit*] with its universality is its *original disease* and the inborn *germ of death*. The removal [*Aufheben*] of this disparity is itself the accomplishment of this destiny [*das Vollstrecken dieses Schicksals*]" (*Enc.* 2 §375). So far, however, I have been silent on the role that death is supposed to play in Hegel's discussion. Thus, the question arises: What exactly is the connection between death, on the one hand, and the process of sexual reproduction and the relation of nonhuman animals to their genus, on the other, according to the interpretive proposal I have put forward up until this point?

We can piece together Hegel's answer to this question from his scattered remarks on the topic as follows: The genus (the horse as such, say) is a concept or universal that unites its manifold instances (e.g., Bucephalus, Babieca, Phar Lap), each of which imperfectly realizes the genus they bear, as we saw in Section 12.2. A condition of the existence of the genus is thus the reproduction of its instances, without which there would be no plurality of individuals for the genus to unite or encompass in the first place. That the genus is a universal that unites any number of its imperfect instances also implies that the genus outstrips these instances, that is, it continues to exist apart from or beyond any one of these imperfect or inadequate instances. In other words, the genus demonstrates its universality, so to speak, in or through the death of the individuals that fall under it. This is the point I take Hegel to be conveying when he tells us that "[t]he genus preserves itself only through the destruction of individuals" (*Enc.* 2 §370). Because in the case of human beings the genus can be fully realized by a single instance, the genus does not outstrip its instances in the way it does in the case of nonhuman animals. As a result, reproduction and death do not, in the human, spiritual realm, play the role that they do in the subhuman, animal realm. To put it in the terms Hegel himself employs: Human beings, unlike their subhuman counterparts, do not accomplish their "destiny" in or through death.

That the role of death in the subhuman animal realm is a function of nonhuman animals' "inadequacy," and that that role is therefore absent from human life, is confirmed by the second of the two passages about death that I have just quoted. In that passage, Hegel tells us that nonhuman animals' "inadequacy" or what he there calls their "original disease" (i.e., their "disparity with [their] universality," as he puts it) is the "inborn germ of death" (*Enc.* 2 §375).[19]

The third objection focuses on Hegel's talk of human beings as the "perfect animal" or even the "perfect living organism." Such talk seems to suggest that our animality, or the way in which the vital processes of formation, assimilation, and reproduction figure in human life, accounts in some way for our alleged "perfection." But exactly what role, if any, is our animality supposed to play in Hegel's discussion of the way in which human beings overcome the "inadequacy" that he thinks affects nonhuman animals? How, if at all, do the vital processes that we share with other animals account for our alleged "perfection"?

Despite what the phrases "perfect living organism" or "perfect animal" might suggest, we should not expect our animality or the vital processes that we share with other animals to be what accounts for our overcoming the "inadequacy" that affects other animals. I submit that the terms "perfect" or "developed," when Hegel uses them to describe human beings as the "perfect living organism" or the "developed animal," are best read as having a privative sense. In telling us that human beings are the "perfect" or "developed" animals, Hegel is in effect signaling that our relation to our animality is unlike that of any other animal. I take him to be getting at the point I am attempting to make about the sense of "perfection" in the phrase "perfect animal" in a passage from his *Lectures on Aesthetics*, where he summarizes part of our discussion in Section 12.2. In the passage I have in mind, Hegel tells us:

> The human being is an animal, but even in his animal functions, he is not confined to the in itself [*Ansich*] as the animal is; he becomes conscious of them, cognizes them [*erkennt sie*] . . . In this way the human being breaks the barrier of his in itself and immediacy [*seiner ansichseienden Unmittelbarkeit*], so that precisely because he *knows* that he is an animal, he ceases to be an animal and attains knowledge of himself as spirit. (MM 13: 112)

In "ceas[ing] to be an animal," our lives and our behavior cease to be dictated by the processes of shape, assimilation, and reproduction in the

[19] See Houlgate 2005, 170–72.

manner in which they are in the case of nonhuman animals. Other animals' bodily behavior is entirely controlled by these three processes. By contrast, our body, and the way in which it can be put to use to assimilate the environment, for instance, is an instrument or tool in the realization of our own spiritual, freely chosen ends. Human beings, Hegel tells us, are the "perfect" or "fundamental type of organism" because our organism, unlike that of nonhuman animals, is "the instrument [*Werkzeug*] of spirit" (*Enc.* 2 §368).[20]

The fourth and final objection concerns the relation between the Philosophy of Nature and the Anthropology. I noted at the outset that whereas the Anthropology has been the subject of growing attention among those commentators interested in the question of the relation between (animal) nature and spirit, the end of the Philosophy of Nature has been comparatively neglected. But what is the difference between the approaches to this question adopted in each of the two texts? The Philosophy of Nature ends with the transition from (organic animal) nature to spirit (see *Enc.* 2 §376 & A). But given that that is so, what exactly is the role of the Anthropology, whose official task seems to be precisely to trace the move from animality to human spirit or, more precisely, from the animal soul to objective consciousness? Very briefly, the answer I propose to this general interpretive worry is that the capacity for thought appears at the end of the "Organics" as a kind of promissory note. It is left for Hegel to make good on that promissory note in the Anthropology and explain how exactly the capacity for

[20] See also *Enc.* 2 §368, where Hegel writes that the "most perfect" organized being found in nature (i.e., the human being) is "the instrument of spirit." According to the line of thought I have been pursuing on Hegel's behalf, human beings count as the "perfect animal" to the extent that they escape the "inadequacy" that afflicts nonhuman animals and are thus the "instrument of spirit," in the sense I have just indicated. However, in Hegel's text, this line of thought is intertwined with another, separate line, according to which the human organism exhibits a degree of "harmony" and "development" that is unmatched within the rest of the natural world. "[T]o say that the animal is more perfect than man, is inept. In one or other respects, the animal can, indeed, be better developed; but perfection consists precisely in the harmony of the organism" (*Enc.* 2 §370A). In an earlier passage, Hegel appears to be making a similar point: "In the perfect animal, in the human organism, [the] processes [of formation, assimilation, and the genus] are developed in the fullest and clearest way; this highest organism therefore presents us in general with a *universal type*, and it is only in and from this type that we can ascertain and explain the meaning of the undeveloped organism" (*Enc.* 2 §352A). If we attempt to bring together the two lines of thought I have just distinguished, Hegel's suggestion seems to be that the degree of "harmony" or "development" exhibited by the human body somehow makes it more permeable to the ends of spirit or more prone to serve as the "instrument of spirit."

thought emerges from (animal) nature. As I read it, Hegel's account of the transition from the animal soul to objective consciousness in the Anthropology thus takes as its raw materials features and capacities that we in some sense share with other animals and explains how human consciousness develops out of those capacities (see e.g., Forman 2010 and Novakovic 2017a).[21]

[21] The initial impetus to write this chapter came out of a reading group with Dan Mendez. Thanks to Dan for the many hours of conversation on the Philosophy of Nature and all other things Hegel. For discussing some of the ideas in the chapter with me, I wish to thank Mark Alznauer and Matthias Haase. I presented a version of the chapter at the European Philosophy Workshop at Harvard. Thanks especially to Michael Rosen for inviting me to present at the workshop and to Lucas Stanczyk and Paul Katsafanas for helpful questions and suggestions about some of the contents of the presentation. Finally, I also wish to thank Marina Bykova for her editorial work on this volume and for feedback on the penultimate draft of this chapter.

PART IV

# *On Contemporary Challenges for the Philosophy of Nature*

CHAPTER 13

# *The Prospects for an Idealist Natural Philosophy*
## *Logic and Nature*

*Terry Pinkard*

## 13.1 What Is the Problem?

Of all the things he did, Hegel's *Naturphilosophie* has had the most controversial and convoluted reception, indeed far more than anything else in Hegel's works. As Cinzia Ferrini has shown in her authoritative history of its reception, outside of a very small acceptance in Hegel's lifetime it was scorned in the nineteenth century as a botched job, perhaps a work of an incompetent in over his head, only to emerge much later on in the 1970s more or less as at least a competent engagement with figures in the history of science, and only from the 1980s onward as something itself of philosophical importance and as perhaps opening up entirely new avenues of research (Ferrini 2014).[1]

Even the term itself, *Naturphilosophie*, proves to be problematical when one tries to translate it. Almost all people writing on it prefer the term "philosophy of nature."[2] However, earlier natural scientists, to use the later term, called themselves "natural philosophers," a usage that Hegel at least somewhat approves.[3] Moreover, Hegel actually stresses the continuity of his *Naturphilosophie* with "natural philosophy" in statements such as: "In the first place, we find *Naturphilosophie* in a peculiar relationship to natural science in general, to physics, natural history, and physiology; it is itself physics, but *rational physics*" (*Enc*. 2, 2). Thus, I shall take Hegel's *Naturphilosophie* to be his "natural philosophy," a *Wissenschaft* (or

[1] Ferrini herself has been one of the leading figures in the rehabilitation of Hegel's *Naturphilosophie*.

[2] Hegel only uses "philosophy of nature" (*Philosophie der Natur*) once in his collected writings, and that is in the first preface to the *Science of Logic*, where he speaks of the *Logic* itself and the two sciences of the real (*realen Wissenschaften der Philosophie*) that follow it: "philosophy of nature and philosophy of spirit" (see *WL*/MM 5: 18).

[3] "What is now called physics was formerly called natural philosophy, and it is also a theoretical, and indeed a thinking consideration of Nature" (*Enc*. §246/*Enc*. 2, 6). In several places, I have modified very slightly Miller's translation (*Enc*. 2). For example, I replace his "Notion" with that of "concept."

"rigorous theory") that he takes to have at least equal standing with the natural sciences.

How one interprets Hegel's *Naturphilosophie* depends on how one interprets Hegel's philosophy overall. Here I shall lay my cards on the table. I locate Hegel's topic – why nature is a proper, even necessary topic for philosophy – within the background of a Kantian–Fichtean debate about the relation of logic to the world and to the possibility of an idealist "natural philosophy," that is, by locating Hegel in what has come to be called a "post-Kantian" mode of interpretation. By this is meant very broadly seeing Hegel as responding to Kant's philosophy by reworking the main themes of that philosophy to avoid what had come to seem to Hegel and his contemporaries as the unavoidable pitfalls in Kant's own statements of his views. The goal of that kind of post-Kantianism is the production not simply of a slimmed down and more consistent Kantianism but something that takes Kant in directions he himself did not want to go but which follow from or are developments out of his central concerns and themes.

Part of the debate in the post-Kantian hothouse of the late eighteenth and early nineteenth century had to do with how to carry Kant forward without any reliance on what Kant himself had thought was completely necessary, namely, pure nonconceptual intuitions (of space and time) to provide content to otherwise empty but necessary self-conscious conceptual form. Almost everyone important in the debate agreed that there were no such things as pure nonconceptual intuitions but how to do without them was a matter of intense disagreement. In his own *Science of Logic*, characterized as a "thinking thinking about what it is to be thinking," Hegel proposed that such pure thought can in fact generate new a priori content for itself so that Kant's own worry about emptiness can be shunted to the side. As all readers of Hegel know, he employed a dialectical method in which apparent contradictions among what seem to be unconditionally valid concepts can – by the way in which thinking tries to stabilize itself in light of such contradictions (and to avoid what Kant called the threat of the euthanasia of reason that comes with such a procedure) – be driven on its own terms to develop new concepts that provide that stabilization.

To this end, Hegel developed a logic, a "pure thought" of "Being" (of individuals as qualitatively and quantitatively determined), a logic of "essence" (of structures that explain appearances of these individuals as having the shape they do), and then finally a logic of "concept" (or of "conceptuality" in general in which one looks at the overall formal and material inferential structure of thinking), capped off with an

understanding of thought grasping that these are indeed the essential determinations of thought thinking about what is a priori necessary for thinking itself (i.e., as Hegel puts it, grasping the absolute Idea as the "method" behind all of this).[4]

## 13.2 From Logic to Nature

However, the way in which Hegel describes the move from *Logic* to "natural philosophy" is and has always been seen as problematic. The move comes at the end of the *Logic*, where Hegel's system goes from the pure Idea in the *Logic* to the *Naturphilosophie* – the pure "Idea" technically in Hegel's regulated terminology is the unity of the concept and its objectivity or reality but, putting it a bit more colloquially, it is the expression of a comprehensive conception of agency and nature. Hegel's description of the move, famous as it is, is worth stating relatively fully:

> [T]he move is an absolute *liberation* for which there is no longer an immediate determination which is not equally *posited* and is not concept; in this freedom, therefore, there is no transition that takes place . . . The transition is to be grasped, therefore, in the sense that the idea freely discharges itself, absolutely certain of itself and internally at rest. On account of this freedom, the form of its determinateness is just as absolutely free: the externality of space and time absolutely existing for itself without subjectivity. (*SL* 753/*WL GW* 12: 253)

The pure thought of the *Logic* is free, that is, completely self-determining, and it now stands in relation to an other that is or is supposed to be no absolute other. However, if nature were something else besides or alongside the pure thought of the *Logic*, then the *Logic* itself would be, as Hegel would put it, only finite, and that would stand in contradiction to what he says about it.

How one makes sense of the passage from *Logic* to natural philosophy really depends on how one sees Hegel's project as a whole (which should be itself a rather obviously Hegelian point). One possible interpretation of the passage, held by many for a long time, would quasi-theological: God (which some take to be the absolute Idea of the *Logic*) emanates the world from himself in the act of creation. Hegel does in fact at times use language

[4] "What is left to be considered here, therefore, is thus not a content as such, but the universal character of its form – that is, method . . . For this course the method has resulted as the absolutely *self-knowing* concept, as the concept that has the absolute, both as subjective and objective, as its subject matter, and consequently as the pure correspondence of the concept and its reality, a concrete existence that is the concept itself" (*SL* 736–37/*WL GW* 12: 237).

that suggests that, but I take his use there to be metaphorical. Instead, I take Hegel to be saying something very generally along early Wittgensteinian lines: Logic is the form of the world, the basis of all intelligibility. But where do we go from there?

If nature were the pure externality of the self-enclosed thought of the *Logic*, then the natural philosophy that would follow would be that which follows a priori from the very thought of there being a sphere that is other than pure thinking.[5] Roughly put, that generation sees the concept of externality itself as already a concept that has been developed in the *Logic*, at first in the "Doctrine of Being," so that the concept of externality is itself not external to the *Logic*, not something brought in from the outside. Hegel's natural philosophy is thus an answer to the question: What is implied in pure thought's concept of externality when applied to pure thought itself? At first, that concept is itself empty. It refers solely to what the pure thought of the *Logic* does *not* encompass, and it follows from the concept of "externality" that is itself already developed in the *Logic*.

Given that question, one possible answer obviously suggests itself, but it is not Hegel's answer, and it would go like this. Outside of logical form, there is nothing more a priori to be said about externality. After stating the case about externality, the rest that comes after would be just empirical observation and empirically informed theory building. On that way of understanding it, since everything else would be an empirical matter, the "natural philosophy" following the *Logic* would turn out to be only a couple of pages long.

## 13.3 What Is Doing the Work of Explanation in Natural Philosophy?

But in fact, Hegel begins his natural philosophy with the categories of space and time since these are the pure forms of the thought of externality to pure thought. Space, he says, is "a mere form, i.e., an *abstraction*, that of immediate *externality*," and he goes on to add that in intuition, space shall correspond to the thought of pure self-externality" (*Enc.* §254/*Enc.* 2, 29).

[5] "Nature has presented itself as the Idea in the form of *otherness*. Since therefore the Idea is the negative of itself, or is *external to itself*, Nature is not merely external in relation to this Idea (and to its subjective existence Spirit); the truth is rather that *externality* constitutes the specific character in which Nature, as Nature, exists" (*Enc.* §247/*Enc.* 2, 13–14). For those (both of you) who are curious about how this relates to the way I earlier presented the relation between logic and nature, this substantially modifies the way I saw the relation between the logical and the empirical in the first part of (Pinkard 2012).

Likewise, time is "the negative unity of self-externality" (*Enc.* §258/*Enc.* 2, 34). Hegel affirms the Kantian idea that space and time are forms of intuition but with a weighty proviso: They are forms of intuition only because they are also the forms of material things, so that, as Hegel puts it, in time "as in the case of space, the distinction of objectivity and a subjective consciousness confronting it, does not apply" (*Enc.* §258R/*Enc.* 2, 34). The thought of something external to the concepts of the pure *Logic* are the thoughts of space and time, and as the basis of the pure intelligibility of nature they are therefore not merely features of our contingent, subjective makeup. Just as the pure thought of, say, quantitative difference is identical to the reality of quantitative difference (since if it were not, there would be no intelligibility to such thought at all), the thought of space as the pure externality of pure thought is the thought of the reality of space.[6] And as the form of pure externality itself, space and time are to be thought of in terms of the categories of "quantity," namely, geometry and mathematics, continuous and discrete magnitudes.

But, as Hegel puts it (which is a point to which we shall return), "nature is, *in itself*, a living whole" (*Enc.* §250/*Enc.* 2, 24), and described purely in terms of mathematical representation, nature would not be represented as the "living whole" it is supposed to be. In fact, if nature were completely the domain of a kind of absolute externality, it would be merely a concatenation of objects, each fully external in its determinateness to the other, and the study of nature would be that of noting and observing regularities and then giving them at best a mathematical form for purposes of prediction. If so, then nature as a whole would only be a grab-bag collection of things and regularities that would possess only as much unity as a particularly formed mathematical theory could give it.

In Hegel's eyes, the very defect of that conception of nature lies not in the idea of a "mathematized" nature itself but in all the forms of overly strong commitments to empiricism as the appropriate and sole method for studying nature.[7] The regularities that empiricists find in nature are indeed real enough, they exist, but they are not, in Hegel's rather technical

[6] This line of thought shares with Christian Martin's writing on the subject the idea that nature as a whole is self-external and thus incorporates continuity and discreteness within itself. See (Martín 2021). That the idea of agency itself would be present in an account of nature is given an admirable explication by (Rand 2016).

[7] Of the laws of motion as established empirically, for example, Hegel says: "The next step concerns their *proof* independently of empirical methods; and this proof has also been furnished by mathematical mechanics, so that even a science based on empirically ascertained facts is not satisfied with the merely empirical *pointing out* (monstrating)[*Weisen* (Monstrieren)]" (*Enc.* §267/*Enc.* 2, 57).

distinction, actual, *wirklich* (or *effectif*, as the French render *wirklich*). Empiricism is not so much wrong as it is one-sided. Empiricism thinks that once it has established the empirical regularities and tied them into empirically based theories, it has explained why things are. However, the job of philosophy (as a kind of Hegelian logic-as-metaphysics) is first to determine the basic objects (or "totalities" as he also calls them) of nature, and by determining them, determine their intrinsic powers (*Potenzen*), and then by virtue of those powers investigate what those objects would do in terms of what would count as following from their nature. What is doing "the work" in nature are these basic "objects," not the regularities. Or, as Hegel defines *Wirklichkeit* (almost always rendered as "actuality"), "What is actual *can have an effect*; something announces its actuality *by what it produces*" ("Was wirklich ist, *kann wirken*, seine Wirklichkeit gibt etwas kund *durch das, was es hervorbringt*") (*SL* 482/*WL GW* 11: 385–86).[8] Or, as we might more succinctly put it: The actual is that which is really at work in reality.

These basic "objects" and their powers are to be established by developing them out of the concept of what is external to (logical) thought. Moreover, or so Hegel thinks, these basic "objects" not only have a nature or "essence" intrinsic to them, they also each stand to each other in a kind of a priori order such that the more elementary of them stand at a lower level of sorts to the more complex, and this ordering itself is also supposed to be a priori, not something discovered after the fact. Only grasped in that way can nature be comprehended as a whole, a unity, and not as the name for a diverse and perhaps incompatible grab-bag of states of affairs.

Hegel establishes this view near the beginning of the "natural philosophy" of the *Encyclopaedia*:

> Each stage is a specific realm of Nature and all appear to have independent existence. But the last is the concrete unity of all the preceding ones, just as, in general, each successive stage embodies the lower stages, but equally posits these, as its nonorganic nature, over against itself. One stage is the power of the other, and this relation is reciprocal. Here can be seen the true meaning of *powers* (*Potenzen*). (*Enc.* §252/*Enc.* 2, 27)

The empirical laws the natural scientist discovers are thus themselves to be explained in terms of the powers the natural philosopher establishes, where those powers express the object's nature, and in the levels of such powers, each is a power of the other (as analogously four is a power of two squared).

[8] DiGiovanni renders the first part as "What is actual *can act*," which I have changed.

## 13.4 The Unity of Nature?

Since nature as a whole would be the unity of these basic objects and not just a collection of empirically established events of various sorts, nor just a collection of empirically established regularities, the empirically discovered laws that govern those objects find their own limits in the limits of the "totality" in question, and natural philosophy would therefore be the derivation of what these objects must be and which objects there are, all in terms of what is necessary to think through the concept of externality to pure thought (i.e., external to the system presented in the *Logic*).

Although the goal of an idealist natural philosophy is to comprehend nature as a whole, which involves the generation of all the forms that would arise from externality to thought and thus incorporate all the ways in which at first discreteness and continuity take shape, and then later as the way in which process and product dialectically play off each other in the chemical object, and then on to a variety of other shapes that all embody the central tensions within nature conceived as a whole.[9] However, nature as a whole cannot itself be neatly grasped completely as a whole. Hegel says of nature that "[t]he contradiction of the Idea, arising from the fact that, as Nature, it is external to itself, is more precisely this: that on the one hand there is the necessity of its forms which is generated by the concept, and their rational determination in the organic totality; while on the other hand, there is their indifferent contingency and indeterminable irregularity." He calls this (quite famously) the "impotence of nature," nature's inability to fully and completely organize itself intelligibly (*Enc.* §250/*Enc.* 2, 22–23).

The idea of the "impotence of nature" throws more light on what these "rational objects" are supposed to be. Although "natural philosophy" necessarily presents nature as an intelligible whole, not all of the necessary forms are realized in the way that the concepts of their domain would seem to indicate. Nature as a whole seems to embody what some have come to call generic universality that is not the universality of quantification (where one counterexample disproves the universalization) but that of a practice or form of life in which there can be many deviations from the universalization that simply count as something like defects, not as disproof of the generalization. (To take Michael Thompson's now iconic example: The three-legged cat remains a cat even if a bit off the norm of feline nature [Thompson 2008, 203].) That however follows from Hegel's conception

[9] For a detailed and insightful overview of this development, see (Ferrini 2009a).

of nature as a whole as something akin to an organic life-form, and although he is happy to take up the requirement, it is not clear that he has in fact established that organic view of nature or instead simply be led by it.[10] In any event, nature's "impotence" is not merely a matter of contingency but of the lack of capacity on nature's part to live up to its concept, of what it is "supposed" to be or do, and that depends on seeing nature as a whole as a life-form.

Even Hegel himself admits that in speaking of the world as an organic life-form, he is using "life" in an extended sense. For example, he says:

> But the concept of life, i.e. life in itself, which of course is found everywhere, is one thing: real life, the subjectivity of the living organism, in which each part exists as vivified, is another. Thus the geological organism is alive, not in its separate parts (*im Einzelnen*) but only as a whole: it is only in itself (*an sich*) alive, not in present existence. (*Enc.* §343Z/*Enc.* 2, 303)

That seems to be saying that all forms of systematic organization of matter in nature (such as the solar system, one of Hegel's prime examples) had to be taken as, as it were, unities on the way to life, so much so that the concept of "living" itself could be extended to them not as they really existed but only in terms of what kinds of possibilities were open to them (in their "in itself," *an sich* existence). All systematically organized matter is on the way to life until it finally gets there. It does not follow from Hegel's system that life was fated to emerge but rather that all it required was the right systematic ordering of matter. The systematic ordering in place was not within the purview of "natural philosophy" to discover, but rather was to be established by the empirical science of biology.

On Hegel's view, instead of presenting itself as a pristine logical system, nature, as external to itself, is always dependent on something other than what it happens to be in order to be what it is, whose overall shape is clear and ordered but whose details, because of the "impotence of nature," necessarily have to be muddy and checkered in parts. For Hegel himself, nature simply does not have, as it were, the power as a whole to live up to all its other powers, to be what it is supposed to be or at least what would follow from its being external to (logical) thought. That is the "impotence" of nature, which is not merely a function of its contingency.

Is that view of nature as a whole logically demanded by the very concept of "externality to (logical) thought"? I for one do not see it. It requires

[10] On the complexities, details, and further outlook for Hegel's idea that nature as a whole is something like (or just is) an organic life-form, see the detailed discussion in (Ferrini 2009a).

some extra premises to make that leap, such as when Hegel says in closing: "The aim of these lectures has been to give a picture of Nature in order to subdue this Proteus: to find in this externality only the mirror of ourselves, to see in Nature a free reflex of spirit: to know God, not in the contemplation of him as spirit, but in this his immediate existence" (*Enc*. §376/ *Enc*. 2, 445). If that is the aim, then something like the view that nature as a whole exhibits something like the structure of a life-form would perhaps make some sense. But without that supposition, that view becomes considerably less compelling. If so, its externality to thought would result in a nonorganic view of nature as a whole, and accommodating that would force a major change in the Hegelian system as it stood in Hegel's lifetime.[11]

The rational objects of Hegelian natural philosophy function more like paradigms for investigation (although not Kuhnian paradigms) but even more so as models to be used in guiding empirical investigation. The mechanical model, for example, which uses analytical geometry and calculus as its view of how things interact sets up a field of investigation (a "totality," as Hegel would see it), and it is this totality which thus sets up Newton to be able to unify Galilean laws about falling bodies with Kepler's laws of planetary motion. Newton could do this, so Hegel seems to say, because of the unity which is already present in the concept of the mechanical realm itself and which then only needs to be posited or rendered explicit. Each of Hegel's "rational objects" of nature is such an ideal model, an unified field of investigation that defines the field's powers and which in turn calls out for an empirical investigation of how these powers actually operate in the vast continuum of nature.

The ideal totalities of nature are, in Hegel's account, what is doing the work in explaining the regularities of nature. These ideal wholes (the mechanical object, the chemical object, the living object, and so on) as each having a distinctive set of powers thus also each exercise a different

[11] James Kreines argues that what is really at stake here is the failure of nature to give a self-grounding for itself. It fails, as it were, by virtue of the incompleteness of reasons nature as a whole can offer for itself. That, according to Kreines, is the "deflationary" aspect of Hegel's *Naturphilosophie*. The "inflationary" aspect has to do with what Kreines calls the "concept thesis," namely, that the reasons that explain why things are as they are and do what they do are immanent "concepts," akin to immanent universals or kinds (Kreines 2015, 325). Christian Martín has argued that in the "concept thesis," Kreines ends up thereby attributing a dogmatic rationalist metaphysics to Hegel which is alien to Hegel's system. As Martin puts it, "the logical and the real are determined in a completely different way: one is a totality of *distinct* internally related thoughts that have their source in the self-determination of thinking, while the other is an *inhomogeneous* material space-time continuum that does not *in itself* involve any *distinctions*" (Martín 2021, 1–3).

form of causality. Mechanical causality, for example, is different from chemical causality. These wholes exercise a form of causality that is supposed to follow from thinking about what is external to pure thought, but as external, the specific causal laws falling under these ideal wholes have to be themselves empirically established. The causal power of the mechanical realm is explicated in the terms of the mathematics of physics, that is, the combination of otherwise mutually indifferent entities that are what they are outside of the wholes into which they are combined. The causality of the chemical realm has to do with the way in which different substantial individuals can combine with other such substantive individuals to make new substances with new and different powers than that of simply adding up the individual powers of the components. In such chemical causality, the product is determined by the process that creates it, and the process is what it is only in combining these matters. Which things combine with which has to do with locating the "elective affinities" (*Wahlverwandtschaften*) that hold between the entities. Finally, there is the area of biology – of life – where, as Hegel says, "the causal relation falls away, and generally in the sphere of life, all the categories of the Understanding cease to be valid" (*Enc.* §343/*Enc.* 2, 117). In life, to be sure, mechanical causality as well as chemical causality is present, but, as Hegel understood the matter, life involved more than just biomechanics and biochemistry: One had to understand the organism as a self-organizing whole, whose parts are functions, and where the parts become detached and identifiable apart from the organism, the organism becomes ill or dies. Hegel's conception of biology was nonvitalist – he posited no special metaphysical force to explain life – but he did claim that the specific mode of organization of life's elements was the crucial matter in accounting for life as a special "object" or totality in nature that was not exhausted by mechanical or chemical models of explanation.[12] Hegel also noted (in a kind of "hedging his bets" way) that "the chemical process is thus an analogue of life," to which he adds, "if the chemical process could carry itself on spontaneously, it would be life; this explains our tendency to see life in terms of chemistry" (*Enc.* §326Z/*Enc.* 2, 236).[13] The domain of

[12] That Hegel was also not a vitalist was in fact recognized by many of the biologists of his own day and taken as a sign in his favor as against the more Romantic conceptions of life at that time. This is discussed at some length in (Ferrini 2009a).

[13] The innovation of cellular biology provided the beginning of just that account, but that did not really start until after Hegel's death. Luca Corti (2022) argues, however, that Hegel's conception of "organism" as "organization" offers a variety of openings to understand Hegelian concepts of life and biology that are in tune with some recent developments in the life sciences.

"life" is that of the causality of self-organization and not that of mechanical causality or the "product-process" causality of chemistry.

This extends all the way to *Geist*, whose constitutive causal power would be that of freedom, which is a power other than all the other natural powers – in fact, it is so different from mechanical causality that it is easy to suppose that it must be a nonnatural power, but it is, at least in Hegel's construction of nature, a firm feature of the natural world belonging to those set of creatures we call "the human" and of which the model is that of *Geist* taken as "self-conscious life." It is not the language of mechanical causality, nor that of chemical causality, nor even just that of organic, holistic self-organization. It is instead that of manifestation, of expression, of the way, for example, a language shows itself in the activities of its speakers and the way in which the speakers manifest the language.[14] How that specific realm of nature develops, how it at first takes itself to be nonnatural, and how it comes back to a recognition and affirmation of its natural status as a matter of its own sociality is, however, another story for another place and time.[15]

Hegel was also aware of the skepticism that many in the community of natural scientists of his day had toward this kind of philosophy since they were for the most part committed empiricists intent on studying regularities. However, he notes: "I have therefore set down here only the rudiments of a rational procedure in the comprehension of the mathematical and mechanical laws of Nature as this free realm of measures. This standpoint, I know, is ignored by professionals in the field; but a time will come when this science will require for its satisfaction the philosophical concept" (*Enc.* §270/*Enc.* 2, 82–83). Hegel's optimism on that point has not exactly borne fruit.

## 13.5 From Logic to Nature (Again)

This brings us back to the issue with which we began, which asks what is the best way to make sense of the transition from the *Logic* to the *Naturphilosophie* and how does this help us to understand what was at stake in Hegel's overall philosophy as a whole? The post-Kantian interpretation I have put forward here suggests the following. The *Logic* is the

[14] As Hegel puts it rather formulaically: "The determinateness of spirit is consequently that of manifestation" (*Enc.* §383/MM 10: 27). I speak about this a bit more with regard to Hegel in (Pinkard 2021). I go into the idea of "manifestation" in more depth in (Pinkard 2022).

[15] On the recent debate about "nature" and "second nature" in Hegel's philosophy of freedom and the sphere it covers, see the important pieces by Andrea Kern: (Kern 2019) and (Kern 2020).

domain of pure thought, pure reason, and it sets the limits for making sense of making sense.[16] However, pure thought has no causal power on its own. It does not therefore form one of the basic models (i.e., Hegel's rational objects) that demarcate what is doing the explanatory work in accounts of nature. Pure thought does indeed have the concept of causal power, but it lacks that power itself. This should not be surprising. Hegel himself speaks this way in a variety of places, but it comes more often to the fore in his practical philosophy, as for example when he says, rather forcefully, that "laws and principles have no immediate life or validity in themselves. The activity puts them into operation . . . has its source in the needs, impulses, inclinations and passions of man" (*LPhWH-N* 70). (However, unlike the Humean model, which sees pure thought and natural movement as two different spheres which have to be added on to each other at best, Hegel sees them – at least with regard to human action – as functional parts within a larger whole.)

On its own, the domain of pure thought is, Hegel says, a "realm of shadows" where the light source has to be that of the unity of nature and spirit coming together to provide the conceptual account of itself, an account which, as logic-metaphysics, is in fact the first book in the whole series in which it gives the final account.[17] It thus presents the image of "infinity" so central to Hegel. In finite matters, the image is that of a line or a series extending out to infinity such that no matter how far out one goes in the series, one always has further to go. Hegel calls this the bad infinite or the untrue infinite. The image of the good infinite, on the other hand, is that of the circle: If one begins at a point on the circle and starts traveling on the line from that, one will eventually come back to where one began, and one will do that infinitely if one keeps traveling. In that way, "thinking" has the infinite as its determination since it starts out empty, gets entangled in new content, and finally arrives back at the point at which it started in the circle. It also follows that to the extent that the circle and not the line is the guiding metaphor, in principle one can start anywhere in the system since one will always end up back there.

Thus, as Hegel somewhat enigmatically points out, the whole system of his kind of *Wissenschaft* is that of a "circle of circles," in which no matter

[16] This conception of "making sense of making sense" – to be distinguished from "making sense of things" – is found in (Moore 2012), but I have adopted it for characterizing Hegel's philosophy.

[17] In his recent and well-received book on the *Logic*, Robert Pippin (2018) took the image of the "realm of shadows" as his guiding motif, but even he admits at the end that it remains a troubling image for the relation of the *Logic* to the philosophy of the "real." My proposals are intended to mitigate some of that trouble.

where one begins, one always arrives back at the same place if one travels long enough (*SL* 751–52/*WL GW* 12: 252). In another work, at the very end of the 1807 *Phenomenology*, Hegel misquotes some lines of poetry from Schiller to use a different metaphor to make essentially the same point: "Out of the chalice of this realm of spirits / Foams forth to him his infinity." Instead of the *Logic* freely "releasing itself," in the *Phenomenology*, absolute knowing, on its way to the system, "foams up" (*schäumt*) as this kind of infinity that emerges only out of the "conceptually grasped history" of self-conscious life – *Geist* – comprehending what it is and what ultimately matters to it (*PS* 467/*PhG GW* 433–34). The image of absolute spirit as merely reflecting on itself without that element of the "real" (in this case, conceptualized history, *begriffne Geschichte*) would only leave us with a picture of self-conscious life sitting on its throne "lifeless and alone," whereas in the *Logic*, we have a metaphorical picture of pure thought coming to see itself as only a shadow seeking to become efficacious in more than its own self-enclosed, self-determining realm of thought thinking thought. In both cases, the point has to do with the self-enclosed nature of conceptual thought, its powerlessness to effect matters, and the logic of that relation of purely conceptual thought and "external to" purely conceptual thought. That image – of the necessity and self-enclosed nature of "pure thought" and the externality of the world without which it would be powerless – is at the heart of the dynamic of the Hegelian system.

## 13.6 Conclusion

The history of science has not exactly been kind to Hegel's view of the a priori status of the basic models he proposed.[18] It has also long struck

[18] Many of Hegel's own interventions in the science of his times are, rather unfortunately, not completely reassuring about his own grasp of what follows from the causal powers of these basic rational "objects." For example, he assures us that water cannot consist of hydrogen and oxygen. "Does water really *consist* of oxygen and hydrogen? It is true that both are turned into water by an electric spark; but water is not composed of them. More correctly, it must be said that oxygen and hydrogen are only different forms assumed by water" (*Enc.* §286/*Enc.* 2, 117). Moreover, what seem to be inexhaustible deep springs (of water) cannot, he insists, be explained mechanically by percolation. "We must not, therefore, explain the origin of inexhaustible springs by mechanically and quite superficially attributing them to percolation; any more than we must use a similar kind of explanation, on the other side, to account for volcanoes and hot springs. On the contrary, just as springs are the lungs and secretory glands for the earth's process of evaporation (*für die Ausdünstung der Erde*), so are volcanoes the earth's liver, in that they represent the earth's spontaneous generation of heat within itself" (*Enc.* §341/*Enc.* 2, 296). He also insists that people cannot in principle get tapeworms by ingesting food contaminated with tapeworm eggs. "This isolated functioning (*Isolieren*) can go so far that animals are generated in the intestines; all animals, at certain times, have worms in the heart, lungs, and brain (see §361, *Zusatz*). In general, the animal is feebler than

readers of Hegel that he might have done better if he had taken more of a view of "natural philosophy" as part of its own time grasped in thought and given it more of the treatment that the *Phenomenology* gave to other formations of self-conscious life (*Geist*) in terms of how it is that we have come to see certain modes of natural philosophy as necessary for us by virtue of the way in which past solutions have broken down and failed (in other words, if he had pursued a philosophical history of science instead of his own "natural philosophy"). In such a view, the unity of nature would be preserved, but space would be cleared out for a more dynamic idealist version of natural philosophy. We have a bit of a model for something like that in Ernst Cassirer's *Phenomenology of Knowledge* (the third volume of his philosophy of symbolic forms) where he explicitly links his version of "phenomenology" to Hegel's own (and not to Husserl's version of) "phenomenology" (Cassirer 1953). Looking at Cassirer's attempt (and at those of his more recent admirers, such as Michael Friedman) might be a way of enriching the Hegelian proposals (Friedman 2001). That, however, would the topic of a very different chapter, which, as far as Hegelian circles that always initiate new circles goes, is exactly what one would expect.

man, who is the strongest animal; but it is a false hypothesis that tapeworms in human beings are the result of swallowing the eggs of such creatures. The restoration of health can consist only in the overcoming of this particularization" (*Enc.* §371/*Enc.* 2, 430). And he assures us we have no need to fear that comets might hit the earth because the solar system is, at least as a rudimentary organic system, a system that protects itself. "For we can then accept the idea that the other bodies of the system *protect* themselves against them, i.e. that they (the other bodies) function as necessary organic moments of the system, and as such must preserve themselves. This point of view can afford better grounds for comfort against cometary dangers than those based mainly on the fact that comets have so much celestial space for their paths, that they should not really hit the earth—which 'should not really' is transformed into a learned theory of probability" (*Enc.* §279R/*Enc.* 2, 100).

CHAPTER 14

# *Is There a Future for the Philosophy of Nature?*

*John W. Burbidge*

Hegel's Philosophy of Nature does not weather well. While he was well acquainted with what was going on in the sciences of his day and found a creative way of weaving their discoveries into a system of increasing complexity, starting with space and time and ending with the emergence of conscious, intelligent life, those sciences have moved on, introducing and validating explanatory models that have transformed our understanding of the world. Physics now sees the speed of light as a primitive concept, while space and time are derivative and flexible. Within a few years of Hegel's death, chemistry showed that electricity produces chemical changes, not the other way around. The year before he died, Charles Lyell provided the evidence that geology had a long history of transformative change (Lyell 1830–33). And within thirty years Darwin provided an explanatory model that gave biology a long history of development. In all these sciences, discoveries have increased exponentially. We now know that the universe has been expanding for billions of years; that atoms emerge from a rich range of dynamic particles of both mass and energy; that the periodic table provides a structure that shows how chemical elements are related; and that biology is currently discovering the processes through which components of living cells both produce the energy that maintains life and structure the development of embryos.

In the early nineteenth century it was still possible for someone to keep abreast of what was happening in science. Physics was primarily interested in mechanics; chemistry was discovering new elements; biology, which had been the hobby of amateur naturalists, was beginning to explore explanatory models. Today each of these sciences has expanded into a rich range of subdisciplines, where only a few step back to consider how discoveries even in closely related subjects are interconnected. To attempt a philosophical system that incorporates all the explanations that have survived experimental check would not only be an act of reckless hubris but also beyond the capacity of even the most voracious investigator.

This suggests that any attempt to revive a Hegelian form of natural philosophy would be anachronistic. As Hegel recognized, history develops and is transformed by changing conditions. One cannot simply impose criteria adopted in past centuries and expect to achieve comprehensive perspectives that make sense of what we are currently discovering. Nonetheless, Hegel also identified the task of philosophy as reflecting on where we have arrived as a human species and finding a way of making sense of it all. So, if our present situation requires humility before the rich range of explorations into the nature of things, it also cries out for effective ways of taking advantage of what we have discovered. For the actions we initiate based on our contemporary understanding play a role in determining what the future will be.

This chapter explores a possible way of resolving this dilemma. It starts, in Section 14.1, by reviewing Hegel's systematic project: how one arrives at a philosophical perspective; the concepts philosophy has at hand for understanding the world; and how one can use those concepts to construct a comprehensive framework that incorporates what the sciences tell us about nature. Section 14.2 identifies key features that have emerged in the sciences over the two centuries since Hegel died, many of which call into question some of his basic assumptions. Section 14.3 proposes a way of rethinking the relationship between what the sciences teach us about the world and the role of disciplined reflective thought. A revised version of Hegel's project may do justice to what we now know about the world.

## 14.1 Hegel's Systematic Project

Hegel's system has four major components. His first major work, the *Phenomenology of Spirit* (1807), showed how to reach the standpoint of philosophy, where we use concepts to comprehend the world. In the *Science of Logic* (1812–16), his second treatise, he explores the way those concepts themselves are systematically interconnected. While the third and fourth components never acquired independent treatments, he outlined what they involved in the manual he provided for his lectures: the *Encyclopaedia of the Philosophical Sciences*. The Philosophy of Nature shows how logical concepts organize what had been discovered about the natural world, while the Philosophy of Spirit develops a philosophical framework for understanding human society. If we want to grasp the central core of Hegel's thought, we need to work out how those distinct disciplines are interconnected.

Once Hegel had worked out how to weave logic, nature, and spirit together into a single systematic framework, he faced a preliminary challenge. People do not use philosophical concepts when exploring the nature of their experience. Normally, as the British empiricists emphasized, we work with *representations* or (their term) ideas. But, as Kant saw, these representations emerge when individuals interact with their environment and are simply associated with each other using the contingent relations of space and time that emerge within the stream of consciousness. They tell us nothing about the structure inherent in reality. Kant proposed that we need to call, instead, on *concepts* to discover objective causal laws, whose reliability is established by appealing to sufficient reasons (see his Second Analogy, A192f./B237f.). But he does not tell us what those reasons would look like nor where they acquire that reliability. That lacuna sets the stage for Hegel's systematic project: "The distinction between representation and thought is all the more important because we can say in general that philosophy does nothing but transform representations into thoughts – although, of course, it does go on to transform the mere thought into the concept" (*Enc. 1*, §20R / *GW* 20: 64).

In the *Phenomenology of Spirit* he shows how that transformation comes about.[1] The method adopted is outlined in its Introduction: One considers a claim to knowledge and implements that claim in practice; when that venture fails to achieve its objective, even after several attempts, it collapses and opens the space for a second claim – one that takes into account what has been learned from the failure of the first (see *PhG* §§77–87 / *GW* 9: 57–61).

Few people notice that in his final chapter on Absolute Knowing (*PhG* §§789–96 / *GW* 9: 423–27), Hegel distilled into abstract prose the process of learning from experience sketched in the Introduction. The beautiful soul passes through confident claim, despair at failure, and new beginning in the sequence of action, judgment, and forgiveness; and, in the Christian tradition, both God and the believer follow a similar pattern as they

[1] When introducing the Philosophy of Spirit in his first course on assuming the Rectorship of the Nürnberg Gymnasium in 1808, after several false starts, Hegel wrote: "§. 1. A beginning in philosophy has above all to consider the different characteristics and functions of spirit through which it passes in order to arrive at science. Since these spiritual characteristics and functions stand within a necessary interconnection, this self-knowledge constitutes a science as well. §.2. The theory of spirit considers spirit according to the different species of its consciousness and according to the different species of its functions. The former consideration can be called the Theory of Consciousness, the latter, the theory of the soul" (*GW* 10.1: 8). The first option appears to refer to what he had developed in the *Phenomenology*, published the previous year. The second anticipates what he will later spell out in his *Encyclopaedia* Psychology.

become reconciled – God through the crucifixion of his son and Christians through the dark experience of the death of God. Those three narratives mark the culmination of the long history of human experience. When one takes them together and focuses on what they have in common, they all tell a tale of confident convictions, putting them into practice, and then discovering new possibilities from their failure. That has been established as the only way to arrive at reliable knowledge. In the *Phenomenology of Spirit*, then, Hegel is outlining the path through which humans, both as individuals and as social beings, move from simply reacting to immediate sensations to developing sustainable ways of functioning within the world.

This, then, sets the stage for philosophy – for exploring the concepts that enable us to both understand the world and act effectively within it. That is the task of the *Science of Logic*. The motor that drives its development can no longer be experience, with its interplay between confident claim and unexpected results, since that pattern achieved its apotheosis when it became fully self-conscious as absolute knowing. The logic works with what has been acquired through that process: with the concepts that have been gradually incorporated into our understanding of the world as the result of our experience. In that work, Hegel sets out to explore how philosophical thinking – starting from an initial, completely indeterminate thought and drawing on what humans have discovered through the ages – moves from concept to concept as more and more determinations come into play.

The engine that makes that development work surfaces in the first moves he makes. When we think about (or intuit, since it is so indeterminate) pure being, Hegel suggests, we discover that there is nothing to consider. Similarly, when we then either think or intuit nothing, we find that it too is completely indeterminate, yet nonetheless a thought – which was the original definition of pure being. Reflecting on what has occurred, he points out that, while "being" and "nothing" have turned out to have the same sense, they nonetheless can be differentiated, because one has moved *from* being *to* nothing, and *from* nothing *to* being. There is a transition – a passing over. The name for such a conceptual passing over is "becoming." Where does that "passing over" happen? From his description of those initial moves, it appears that the transitions emerge when we are either thinking or intuiting the relevant term. It is a function of our psychology.[2] In other words, what moves the argument from concept to concept is the process of thinking through carefully what each one means

[2] This seems to violate Frege's psychological fallacy; but see Burbidge 2013 for a rebuttal.

and the implications that emerge. For Hegel, then, the role of the *Logic* is to work out the connections linking thought to thought that have survived the distilling process of accumulated experience. Having repeatedly learned from failed ventures, we retain in our thoughts the fundamental patterns that govern the world within which we live.

Two examples of how the *Logic* works will set the stage for later discussions. The first looks at the move from the concept "finite" to "self-contained being" – or (in literal translation) "being-for-self."[3] The concept of a limited being, or something finite, implies that there is a barrier that prevents that thing from going beyond the limit. What is beyond the limit is the opposite of the finite; in other words, the infinite. But that infinite turns out to be itself limited because it is defined by its opposite. Thus, thought ends up with an infinite regress which moves from the thought of something limited to the infinite and back to something limited. (It is important to remember that we are thinking of the meanings of concepts, not the objects those terms could refer to.) We have a double transition that moves back and forth ad infinitum, which happens to introduce a second sense of "infinite." At this point Hegel makes his most distinctive move. For that repetitive cycle collapses into a new thought: of a single process that continually generates the infinite from the finite and the finite from the infinite. Such an infinite process turns out to be self-contained, a being-for-self.

The next moves are significant. For a self-contained being is a unit, what Hegel calls a "being-for-one." As a unit, or "one," there is nothing external that relates to it. To that extent it is situated in a void – pure emptiness. Whatever happens to be there would have to be equally self-contained and isolated. So one reaches the thought of a multitude of units, necessarily isolated from each other, driven apart by a process of repulsion. But a process can only be maintained if it is constantly being rejuvenated, and the only way to rejuvenate repulsion is to presuppose a contrary attraction. One has, then, ended up with discrete units that nonetheless attract and repel each other in a continuum, which turns out to be a good definition of the concept of "quantity."

In other words, within that discussion of being-for-itself, Hegel has developed the conceptual core of Democritus' atomism, in which a multitude of indivisible, self-contained atoms function in a void.

The second example is Hegel's discussion of cause (*GW* 11: 405–7). In that analysis, he starts from the fact that an agent cause has, as its

[3] The German phrase *für sich* has the same sense as the English "of itself" in "in and of itself."

necessary counterpart, a passive condition or set of conditions which it acts upon. Both the active and the passive moment are requisite for the cause to become operative. That means, however, that until the passive condition makes its appearance, the agent cause is itself passive and unable to produce its effect. It becomes active only through the agency of what initially we called the passive condition. Thus, for any causation to be effective there is a kind of double activity; each moment is in one respect passive and in another active. The two causes reciprocally interact. However, just as the reciprocal action between finite and infinite collapsed into the concept of being-for-self, and the reciprocal action between attraction and repulsion collapsed into the concept of quantity, reciprocity collapses into an integrated process which incorporates all its components within a single dynamic. Since it is the nature of conceptual thought to integrate singulars, by virtue of their particular characteristics, into a universal, Hegel uses the term "concept" to characterize this thought of an integrated reciprocity.

By turning our focus, in the way these examples suggest, from the casual associations that regularly structure the stream of consciousness to disciplined reflection on what is contained in the concepts that have survived the refining process of experience, philosophy articulates the patterns and relationships inherent in the world. Logic has taken over the role formerly played by metaphysics.

Hegel engineers his move to the Philosophy of Nature at the end of the *Science of Logic*. The *Encyclopaedia* Logic concludes by making explicit the method that has structured its development. Each concept can only be defined by relating it to its opposite; that second concept equally requires reference to the first. That double transition collapses into a new, more complex concept. In this way the method ties all the concepts into a single, integrated dynamic. Central to that dynamic is the move from a concept to its contrary or opposite. So, once it has worked out its own integrated method, conceptual thought starts to wonder what its opposite would be like: What is the nature of the realm of external, contingent relations that is other than thought? In the course of its development, the Logic has already shown how the concept of the internal is related to the concept of the external, how the concept of contingency is related to the concepts of actuality, possibility, and necessity, and how the concept of the singular is related to the concepts of the particular and the universal. These moves have provided the theoretical resources for setting whatever is other than logical within a philosophical framework. Pure thought can thus confidently "let itself go" ("*sich selbst frei entläßt*" *GW* 12, 253, my translation) and turn its attention to the real, nonlogical, world.

When it starts from the bare thought of external relations – of being next to each other without any linking relationships – thought looks at the world and sees that space fits that model. Under analysis, thought, expecting to find internal differentiation,[4] notices that space has its own complexity. One can start from a single point, move to the relation between two points in a line, on to lines set out in two dimensions, and end with the three dimensions that mark its distinctive nature.

Thought, then, reflects on what it has discovered. It has found a structure of external relations which nonetheless has internal distinctions. It develops the concept of an external relation which not only has internal differences but can also move from one state to a second, externally related state. When it turns back to the real world, it discovers that time fits that model. After it has explored the characteristics of time, it combines what it has discovered and formulates a new concept: an entity that is situated in space but also develops through time. That thought involves place, matter, and movement.

The philosophy of nature has used the skills of conceptual analysis to organize what it encounters within the world of external relations.[5]

In his major works, then, Hegel has developed a closely integrated philosophical structure, using the resources of conceptual thought. In the *Phenomenology* he outlined the way conscious agents learn over time and which universals have reliably captured the way experience functions. In the *Science of Logic* he explored the network of relationships that bind those concepts together. Consequently, in the Philosophy of Nature he used those fundamental patterns to organize what experimental science tells us about the real world.

## 14.2 How the World Has Changed

### *14.2.1 Where Hegel Got It Wrong*

In the schematic outline of his system developed in Section 14.1, Hegel's move to the Philosophy of Nature involves logical thought recognizing its

[4] See *Enc. 2* §255 / *GW* 20: 244: "Space, as in itself **the concept as such**, contains within itself the *differences* **of the concept**, (a) In the indifference of space, these are immediately the three *dimensions*, which are merely diverse and possess no determination whatever" (my emphasis in bold). Note that, in the Philosophy of Nature, Hegel regularly uses the term "the concept" (*der Begriff*) to indicate where conceptual thought comes into play.

[5] Spirit introduces into that world of external relations a kind of being that embodies internal relations. So, the task of the Philosophy of Spirit is to construct a systematic picture of how spirit functions, starting from a basic sensitivity to the natural world in which it finds itself and ending with the panorama of world history.

limitations. It "lets itself go" to take account of external relations and explore how they are to be understood. In addition, because the Logic has already explored the conceptual relations between internal and external, contingent and necessary, and singular and universal, it has the tools for framing that investigation. When applying that structure, however, Hegel was prepared to do more than simply organize what science had revealed systematically. He also ventured into the debates of the scientific community as it sought to understand and explain the evidence of experience and experiment. I consider several of these ventures.

First, in the Introduction to his Philosophy of Nature he notes that, while nature is to be regarded as a system of stages, development from one level to another is not one of its inherent features. Only conceptual thought can show how one stage is related to the next (*Enc.* 2 §249 / *GW* 20). In his lectures he makes explicit that he has thereby ruled out both emanation and evolution. In other words, the developmental history inherent to the accumulation of knowledge through experience is excluded a priori from the processes that govern the way nature functions.

The reasoning that lies behind his position is indicated in the previous paragraph (*Enc. 2* §248 / *GW* 20). Nature lacks freedom, and therefore is a realm of only contingency and necessity. Necessity lies in the structure of natural law, through which everything is causally determined. Contingency stems from the fact that, whenever those causal forces happen to intersect, the unique conditions of that intersection influence what actually emerges. There is no space between those two features where natural forces themselves initiate significant novelties. Because he has shown, in the *Phenomenology of Spirit*, that conceptual thought is grounded in conscious experience, Hegel assumes that whatever is not governed by consciousness does not have a genuine history.

A second example comes from his discussion of the various kinds of substance that chemistry was isolating during his lifetime. When he was born, Carl Scheele and Joseph Priestley were in the process of capturing pure oxygen. When he died, Humphrey Davy was using electrolysis to isolate sodium, potassium, chlorine, and iodine. A scientific consensus was gradually forming: All substances that cannot be further broken up into components by chemical means should be called elements. They are the fundamental constituents of matter, ranging from hydrogen and oxygen through sulfur and phosphorous to silver and gold. Each of these elements was composed of atoms: unchangeable units of matter which, as their name implies, were themselves indivisible. This latter claim was based on the figures that emerge when chemicals are combined. In stable

compounds, the constituent "elements" are always found in discrete ratios – 1:1, 1:2, 3:2, and so on – never as a varying continuum. That implied that something like Democritus' theory of atoms underlies the material world.

Hegel took issue with both parts of that consensus. In the first place, he insisted that the basic substances needed to be distinguished not by what they are but by the role they play in nature. The term "elements" he limited to the basic components of water and air – oxygen, hydrogen, nitrogen, and carbon – which seem central to all chemical processes. The rest were separated into four kinds of other substances, distinguished by the specific roles they played in those chemical changes: metals, metallic oxides (or, as they had been traditionally called, earths), combustibles such as sulfur, and salts. Hegel knew that oxides and salts could be decomposed into simpler substances, but these seldom surface as such in nature. They are isolated only through the intervention of controlled experiments.

In the second place, while he acknowledged that the role of definite proportions in compounds suggested that basic substances existed as specific units and, in his *Logic*, had identified the concept of a unit (or "one") of self-contained being, Hegel refused to call them atoms. For that, following Democritus, meant that they were indivisible spheres moving mechanically in space. And his *Logic* had shown that the concept of a self-contained unit was not primordial but emerged from a reciprocal interaction between finite and infinite.

Hegel's disagreement with the developing consensus emerged from his Logic. He held that the concepts that result from our cumulative experience establish the framework for any reliable explanation of natural phenomena. And the basic determinate concept is "becoming," which then collapses into "determinate being." When chemistry isolated more and more simple substances, it was interested in what they *are*. They opted for the term "element," which had traditionally been used for earth, air, fire, and water. Hegel, more interested in what things *do*, restricted that term to just hydrogen, oxygen, nitrogen, and carbon. Similarly, when evidence emerged that chemicals combine in determinate proportions, the chemistry of the day opted for Democritus' term, "atom," because the units involved could not be reduced to smaller constituents by chemical means. For Hegel, on the other hand, an ultimately indivisible unit was simply prey to the external forces of attraction and repulsion; it could not initiate any chemical process on its own.

(Events would eventually show that Hegel's intuitions on the latter point were justified. In 1911, Ernest Rutherford established that the mass

of a gold atom lies in a much smaller central core, later identified as its nucleus, formed of protons and neutrons, with electrons fleshing out the space around it. Eventually it was shown that, in chemical compounds, some electrons perform functions for two different nuclei at the same time.)

A related controversy suggests the problem with Hegel's approach. Chemistry, led by Humphrey Davy, had exploited the process of electrolysis: When metals of different types (copper or silver on one side, tin or zinc on the other) were connected by a wire and put into a solution, an electric current resulted. Using this procedure scientists were successful in isolating and discovering new elements. An active debate emerged about whether that process was primarily chemical, based on the different natures of copper and tin, or electrical, based on the difference between positive and negative poles. Davy claimed that it was primarily electrical with chemical results. Hegel opted for the contrary claim, and moved his discussion of galvanism (as the process was called) from the paragraph on electromagnetism to the section on chemistry.[6] He based his decision on experiments conducted by a colleague in Berlin, Georg Friedrich Pohl, who had become a convert to the natural philosophy of Schelling and Hegel. In this case, the debate was not simply a question of finding the right concept, but choosing which experiments to believe. Within a few years of Hegel's death, Michael Faraday would establish that galvanism was an electrical process, proving that Davy had been correct.

This cluster of disagreements makes explicit a particular problem with Hegel's systematic model. The concepts that are explored and developed in his *Logic* have emerged in human thought through centuries of cumulative experience. But chemistry was in the process of finding new entities and functions that had been hidden from the past but were becoming evident as more precise measurements were being made. Those discoveries did not fit easily into conceptual frameworks that were inherited. And the scientific community, trying to capture the significance of what was going on, had to try out familiar terms that could serve as metaphors. Familiar concepts, which matched some features of a term but not all, became stretched and transformed. For it is not just human society that has a history; so does the process of formulating scientific explanations. Since absolute knowing is a process of always learning new things about the world, none of the specific conclusions that emerge over time are absolute. Relying on a single systematic thread that leads through a sequence of concepts has become

[6] See *Enc.*, the end of *GW* 13 §250R (compare, *Enc.* I *GW* 20 §324R and §330).

problematic; one cannot assume, before taking into account the way our knowledge of the world changes, that our thoughts from the past set the standard for how we should interpret the present.

### *14.2.2 How Nature Has Reshaped Our Concepts*

Developments in science over the past 200 years have continued to transform the context for any philosophy of nature. Several are sufficiently critical to put Hegel's whole systematic project into question. For nature is now understood to have a history; space and time are no longer primitive absolutes; and our human ability to think rationally has itself emerged as the result of natural processes.

In the first place, geology, biology, and now physics have taught us that nature has a history. For Hegel, the necessity that characterized nature meant that, while contingent variations could occur, there were no genuine novelties, for that required freedom. But Darwin proposed that accumulated variations, together with the process of natural selection (through which only those organisms with beneficial variations survive) could produce new species. Recent biological research, using the evidence provided by DNA, has established that life emerged just once, when the first proto-bacterium developed a sequence of chemical processes that was sustainable and could be reproduced. Similarly unique initiatives occurred when one primitive cell, likely an archaeon, acquired a nucleus; when one of its descendants absorbed another kind of primitive cell that promoted the cell's ability to generate energy, initiating mitochondria; when the original ancestor of plants consumed another kind of bacterium that enabled it to process sunlight and carbon dioxide; and whenever organisms developed new capabilities (see Kirschner and Gerhart 2005; Nurse 2020). Physics, too, identifies uniquely creative moments: In the first milliseconds after the big bang, when protons and neutrons were formed out of gluons and quarks; three minutes later, when they developed into what would become the nuclei of atoms; much later, when negative electrons were able to sustain a relation with positive protons without losing their contrary charges, forming hydrogen, helium, and lithium (see Gribbin 1998). While none of these processes can be described as free, they nonetheless suggest that, out of an original indeterminate context, conditions can emerge in nature that introduce genuinely novel kinds of entities and processes. Like critical events in human history, they transform the range of possibilities.

In the second place, our conceptions of time and space have been transformed. While geology and biology initially made us aware that the earth and life on earth could be traced back through millions of years, it was physics, once it realized that some apparent stars are in fact galaxies and that those galaxies are moving apart from each other, that placed the origins of the cosmos nearly fourteen billion years ago, and realized that space extends well beyond anything we can now receive information about, and continues to expand. In addition, Einstein's theories of relativity established that the flow of time is not a constant but depends on the relative velocity of moving objects; and that space is not Euclidean but bends to take account of the presence of massive objects. Neither are absolutes that provide the context for all nature but emerge from a more fundamental absolute: the speed of light.

In the third place, given that spatio-temporal context, we now know that humans have occupied a very minuscule portion of the full range of space and time and are unlikely to last long as a species. The ability to reason is not inherent in the cosmos but has emerged within the history of life on earth. So there is no guarantee that the concepts we use provide a fully reliable insight into the nature of things. For concepts, as Hegel realized, are shaped through our experience of failed predictions and our ability to focus consciousness on the details of their significance, and that is contingent on changing conditions. As well, whenever we focus our attention, we ignore much else; and that means we fail to notice those anomalies and inconsistencies that reveal the limitations of our achievements. In other words, human reasoning does not have the resources for developing the realm of "the unvarnished truth as it is in and of itself, without veil" or an "exposition of God as he is in his eternal essence, before the creation of nature and any finite spirit" (*SL* / *GW* 21: 34, my translation).

In the time since Hegel lived, then, we have discovered that nature has a history and that human reasoning has emerged as a product of the natural world. Nature is no longer the contingent expression of a primordial rational structure to which we have an unambiguous access.

## 14.3 How to Move Forward

Those changes challenge the fundamental convictions that determine Hegel's philosophy: that human experience has led us to reliable insights into the nature of reason; and that philosophical thought already has all the resources it needs to organize its understanding of nature. Without those presuppositions, it becomes impossible to construct an integrated system.

But that does not mean that one has to abandon any thought of a philosophy of nature. For there are several features of Hegel's endeavor that can still contribute to a comprehensive grasp of the natural world.

First, in Hegel's *Phenomenology of Spirit* it is by learning from the experience of failure that we humans improve our claims to knowledge. Ventures fail because we assume that we already know enough to master all truth. And we are constantly being forced to take into account features of the world we have previously overlooked. But that work ends with a chapter on Absolute Knowledge, which suggests that that process has, in principle, come to an end. Once we recognize, however, that nature has a history, and, over time and with new combinations of causal conditions, genuine novelties appear and become stabilized, the virtue of humility is reinforced. We no longer assume that we already have all essential answers, which can be enshrined in a metaphysical logic. The process of learning from our failures, central to the *Phenomenology*, continues to reorganize our fundamental concepts. A contemporary philosophy of nature needs to regularly take note of those features in our collective experience where events have not turned out in the way we expect and initiate investigations into why they failed.

Second, Hegel's analysis, in the *Science of Logic*, of the way concepts are linked together through tendrils of thought that explore contraries, conditions, and implications provides a valuable resource for honing skills in disciplined thinking. Nurtured by his perceptive and detailed analyses, we are better prepared for seeing what is missing in what has already been achieved and for exploring alternatives. It may no longer be appropriate to expect a single itinerary that traces a systematic path toward a final discussion of method. Indeed, in the second edition of Book 1 (*SL* / *GW* 21), Hegel himself rewrote a number of key transitions, suggesting one can always discover other paths to follow. Nonetheless, in the history of philosophy it is hard to find anyone else who has explored so effectively the way systematic and well-regulated thought sets aside the casual associations of subjective streams of consciousness and focuses on the ways reflective thought moves from concept to concept.

Concepts are to be distinguished from our sensory experiences – what Locke and Hume called our ideas and Kant and Hegel called our representations. The latter tell us both *what* things are and *what* they do; in contrast, concepts capture *why* they do so: the conditions that lead to those kinds of things, the results that follow, and what is explicitly avoided. In other words, when experience teaches us that things do not work out as we expected, we rely on conceptual thinking to find an explanation.

Hegel's Logic has explored in intricate detail the tendrils of thought incorporated into those general meanings.

Third, Hegel challenges us to broaden the focus of our attention to incorporate as much detail about the way the world functions as possible. When one considers the range of topics he discussed in his lectures, one is amazed that he found the time to keep up with the literature. Reports on religious traditions from the far reaches of the world, works of art throughout the ages, and political developments in Europe and the new world, as well as recent discoveries in mechanics, physics, chemistry, geology, and biology, all provide material to flesh out the conceptual bones of his system.

Such a breadth of understanding was unusual, even in his own day. Since then, the exponential expansion in our knowledge of both the natural and the social world makes it now impossible to replicate. Scientific disciplines have become subdivided into specialties, each one of which requires a lifetime to master. Developments in anthropology, economics, political science, psychology, and sociology have enriched our understanding of the way humans function. Explanatory theories are continually being put into question by new discoveries, both in the sciences and in our social and political lives. It is impossible, in our day, to even approximate the comprehensiveness of Hegel's perspective.

Indeed, a critical factor in the way we humans interact with the world complicates even Hegel's attempt to be exhaustive. Whenever we focus our attention, we ignore a wide range of events that are going on around us. By concentrating on specific areas, we easily miss much else that could easily have bearing on our immediate concern. The challenge, then, is to expand that focus: to increase our understanding of what is currently going on in the rich multitude of scientific disciplines and social arenas, to take note of anomalies that confound our confident expectations, to explore the reasons why causal patterns in different spheres are both similar and different from each other, and to develop broad explanatory theories that throw light on why things develop the way they do. Precisely because we tend to assume, like many readers of Hegel's *Phenomenology*, that we have already discovered all that is critically necessary for understanding the world, we are prone to forget the limitations inherent in our species. We are fallible beings. There is, then, a role for something rather like Hegel's philosophy of nature, which not only takes account of as many details as possible and endeavors to set them within a broad perspective, but which is also, with conscious humility, open to the possibility that

"there are more things in heaven and earth than are dreamed of, or can be dreamed of, in any philosophy" (Haldane 1927, 286).[7]

By continually learning from experience, by developing skills in conceptual analysis, and by recognizing that any comprehensive perspective will always be partial and open to unexpected developments, we can build on Hegel's initiative and develop a contemporary philosophy of nature.

Central to Hegel's philosophy, enshrined in the transition from Book 2 to Book 3 in the *Science of Logic*, is the conviction that reciprocal interaction is the critical condition, necessary for achieving conceptual understanding (*GW* 11: 407–9). What is emerging from our discussion is that there is just such a reciprocal interaction between the way the experimental sciences investigate the causal patterns that determine how nature functions and the way reflective thought sets those discoveries into conceptual structures that reveal how and why things function as they do. Our concepts direct the focus of our attention to particular sets of facts; unexpected facts force us to reevaluate and reconfigure our concepts.

So, a contemporary philosophy of nature will involve a double process. On the one hand, new discoveries in science may lead to major revisions in our concepts; on the other hand, careful thought may open new ways of understanding the phenomena science investigates.

We find indications of that first process in Hegel's revisions to the second edition of Book 1 of the *Science of Logic*. The chapter on Measure explores the logic involved when we use quantities to define qualities. In the course of that chapter he moves from a discussion of elective affinity (the way two salts in a solution exchange constituents and become different salts) to what he calls "The Nodal Line of Measured Relations" (where continuous quantitative changes in the proportions of two elements trigger significantly different qualities). In the first edition of 1812, written while Hegel was Rector of the gymnasium in Nürnberg, the first paragraphs of the second section offer an obscure and complicated discussion of the relationship between the quantitative and the qualitative (*GW* 11: 312–16). In the second edition, published after he died in 1831, he took advantage of the recent discoveries that had led chemists to adopt atomism: that chemicals combine in very specific ratios. To be sure, in 1812, he referred to those discoveries in his Remark, and the account of those discoveries remain in his Remark. But in 1831, by talking about "combining" and "determining ratios," he introduced into his primary

[7] An amendment of Shakespeare: *Hamlet*, act 1, scene 5, line 166.

argument conceptual language, which picked up on what the chemists had discovered, to both clarify the concept of "nodal line" and show how it leads to the concept of "the measureless" (*GW* 21: 364–66). With this shift in vocabulary, the sciences were not simply instantiating the logic; rather logic explored new conceptual relationships based on what it was learning from the sciences (see Burbidge 1996, 58–59).

When one considers changes in the way the sciences now measure phenomena to determine what is actually going on, one would anticipate the need to rethink radically the whole discussion of measurement. Physics, for example, measures the red shift in the light emitted by distant galaxies to determine how fast they are moving away from us, and measures the elements that make up stars by putting their light through a prism and noticing which particular bands of color are missing. In biology, counting bodies in a sample of blood determines the risk of cancer or stroke. What are the significant concepts critical to these processes, and how do those concepts relate to each other? Those are the kinds of question contemporary philosophers of nature would pose as they incorporate into their logical arsenal the discoveries that science is continually contributing to our accumulated experience.

But it is not simply that philosophy can improve its ability to interpret what goes on in the world by noticing what science is discovering. Science can also improve the theories and explanations it develops by becoming more adept in employing the tools of conceptual thought.

Two critical functions characterize scientific developments. The first involves developing more and better ways of isolating particular characteristics and functions in the world through the use of rigorously controlled experiments and sampling techniques. The second involves taking the information thereby discovered and developing conceptual explanations sufficiently robust to make successful, but previously unexpected, predictions. The first isolates more and more aspects of our complex and confusing world. The second proposes more and more comprehensive pictures that explain why the world functions as it does.

By finding ways of isolating particular causal processes from interfering conditions, science has been able to identify specific ways our world functions. Galileo developed techniques for measuring the way bodies move in space; Lavoisier established that oxygen is required for combustion; Edwin Hubble realized that the "red shift" in the light from distant galaxies provides evidence of the speed with which they are moving away from us; François Jacob and Jacques Monod determined that active proteins in the cell are turned on and off by other proteins in response

to environmental conditions. The precision in detail achieved by successful experiments has led to profound changes that have transformed our world.

On the other hand, the need for an explanation arises when things do not turn out as we expect. Familiar and well-known initiatives no longer work as planned. As we continually discover the complicated way causes interact, we explore more comprehensive frameworks to explain those anomalies. We expand our focus from what causes do in isolation to what happens when they intersect and converge. Major advances in scientific knowledge emerge from combining into a single framework a multiplicity of discordant facts.

But unlike experiments, the generation of successful explanatory theories is not a process that can be strategically planned in advance. To be sure, it starts from curiosity: about unexpected anomalies (mold inhibits the formation of a bacterial culture) or about why different events share a peculiar pattern (the falling of an apple strangely resembles the way planets revolve around the sun). And it ends with explanations that make effective predictions that would not otherwise have been successful and result in technical strategies that change the way the world functions. There is, however, no single, straightforward route from that kind of beginning to that kind of result. Puzzles are puzzles because they do not conform to the familiar and reliable expectations we have inherited from our past. Likely solutions range over an indefinite multiplicity of possibilities. And while some of those possibilities can be easily ruled out because of what we have already discovered, there are no criteria we can apply in advance to isolate from the plausible remainder the one or two that will turn out to be effective.

It is at this point where the three features we have retained from Hegel's Philosophy of Nature have a role to play. For they identify skills that can expedite the reflective move from puzzle to effective explanation:

1. We start with Hegel's insight that the reliable concepts we use in our thinking about the world have emerged from the experience of failure. A significant shift has occurred in what we mean by "rational." For Hegel (and other logicians), human thought, having been adequately disciplined through experience and reflection, gains access to the essential structure of the universe. But we are now aware that we are simply one species, with particular faculties, that has recently emerged within the vast range of expanding space and time and is continually discovering new features of the world. Since our experience is fundamentally limited by our position in the universe, we need to

focus, not on what we already know, but on links and connections we have previously ignored. It is the experience of failure that awakens us from our lethargy. In other words, we only discover whether our concepts are reliable once experience has separated what works from what does not. Unlike Hegel, we can no longer use reason to tell us how nature is to be understood; we discover what is rational through the experience of failure.

2. Hegel's *Science of Logic* explores the implications inherent in those concepts that have emerged from our cumulative experience. When confident expectations fail, reflective thought still has to rely on concepts when exploring why things went wrong. The more we become aware of the causal patterns that lead to failure, the more effective are the explanations that shape our initiatives. It is this network of causal relations – both those that frustrate and those that bring about particular results – that constitutes the meaning of our concepts and distinguishes them from our casual ideas or representations. And it is this network that becomes explicit as disciplined thought works out the significance of those concepts. By reflecting, then, on what is involved in both failed and successful predictions, we become aware of the connections and implications that tie thought to thought. In other words, using the kind of careful analysis that Hegel undertook in his major work, we are able to set aside impractical hypotheses and concentrate on predictions that make a difference.

   Proposed explanations are of little value if they have no influence on what happens in the actual world. We need to make predictions precise enough to discriminate among various alternatives and take note of whether and why they succeed or fail in capturing what happens in the future. We need to be disinterested:[8] to refrain from using our interests and preferences to direct the movement of both our thinking and our observations. And we need to venture tentatively and with care until the confirmation of experience accumulates over time and through varying conditions and circumstances. It is as our proposals survive rigorous assessment – both in their formulation and in their application – that we develop confidence in their reliability.

3. We need to expand the focus of our attention. Reflective scientists are able to propose and establish new ways of understanding the world

[8] Being disinterested does not mean that we are apathetic. Rather, we exercise discipline to prevent our interests from distorting the investigation.

> because they are familiar with what is going on in their specialty. But they are also prone to assume that the world generally must fit within that familiar framework. While philosophers cannot match their familiarity with detail, they can broaden the range of experience taken into account. They can explore what is being discovered in a diversity of fields; they can draw attention to inconsistencies that surface when disciplines are compared; and they can incorporate anomalies that have emerged elsewhere that do not fit the assumptions of a particular discipline. We can never hope to be completely comprehensive. But the wider the range of human experience we take into account, the more resources we draw on when searching for explanations.

Any reasoning that leads to the discovery of new truths about the world has to integrate various entities and functions into an explanatory framework. That quest can benefit from an appeal to analogy. For analogies point to similarities shared by quite different kinds of activity. For pure logicians, analogies have a bad reputation, since they cannot establish the truth of their conclusion; the differences between the patterns being compared may be more significant than their similarities. On the other hand, by taking those differences into account and working out how they intersect with the functions that are similar, an argument from analogy provides an effective way of improving our reasoning. For we then do not simply isolate a shared pattern; we notice the way differing conditions transform the way similar processes work and widen the range of possible explanations.

Analogies, for all their problems, have one feature that makes them singularly useful when looking for new explanatory theories. Unlike the statements of Aristotelian logic, where subjects and predicates are simply linked with a copula, and unlike the propositions of formal logic, where individuals simply instantiate functions or concepts, they easily incorporate complex sentences that are built around active verbs – sentences that relate a diverse range of agents to one particular dynamic process or integrate a number of processes through the effective use of participles and subordinate clauses. Each constituent relation contributes its distinctive characteristic to the total network; when combined into a single sentence, the picture can become quite complex. Analogies based on verbal sentences, then, provide the logical means for working out conceptual explanations.

The process the philosophy of nature adopts for discovering new insights into the way nature functions are versions of this same process, used in the sciences, for formulating hypothetical explanations. It notices

significant anomalies; it explores ways of fitting those anomalies into what we already know about the world; and it turns back to experience to see whether that understanding improves our ability to act effectively in the world. But it incorporates a broader range of information. It notices how the various sciences differ in the way they function; it takes into account not only the results of disciplined research through controlled experiments but also the dynamics of concrete existence, where it is frequently impossible to isolate the influence of individual causal initiatives; and it tests its explanatory hypotheses by taking careful note of what happens whenever people rely on carefully worked out predictions when making decisions.

Consider, for example, the term "cause," which plays such a central role in all explanations. In the seventeenth century, science assumed that all causation involved matter in motion. When moving things met, things happened. Gravitation, however, did not fit that mechanical model. It turned out that other forces, like magnetism and electricity, also do not involve direct contact, and light can move through a vacuum. In neither case is matter involved. Relativity changed things further by introducing the concept of the field. And quantum mechanics talks about causal patterns involving crowds, not individuals (see Einstein and Infeld 1938).

When we move beyond physics, we find other variations on the theme: Elements combine and recombine through chemical processes; species originate by means of natural selection; and living cells involve a complex network of chemical interactions to maintain their individual integrity.

This rich complexity suggests a possible domain for the philosophy of nature. By taking note of the various ways causal processes actually bring about change it can use analogy to establish a basic concept of cause that covers not only all natural cause but social action as well, and then spell out the significant differences that determine why each kind functions in its own way.

No longer can philosophers expect to be knowledgeable in as many areas as Hegel. But as members of the community of reflective thought that is constantly seeking to broaden the focus of attention, they can bring their skills in exploring the links between concepts to the task of understanding the complex world in which we live.

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